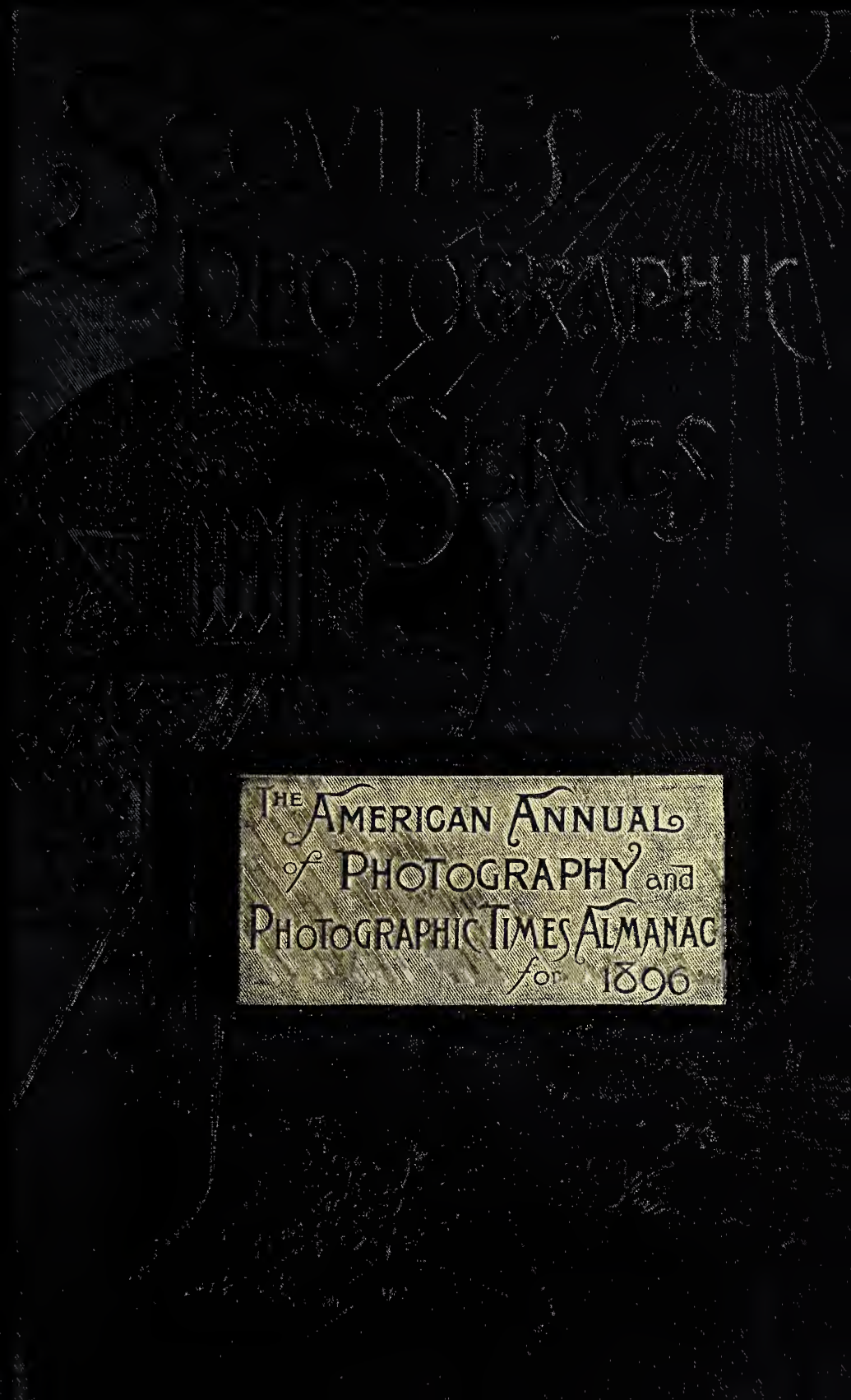
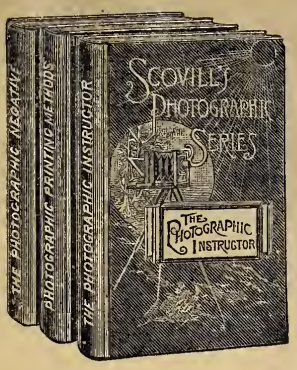

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# PREFACE.

THE remarkable success which has attended the publication of The American Annual of Photography and Photographic Times Almanac may, we think, be taken as sufficient evidence of the usefulness of the work. The present volume is the tenth of the series, and, as in previous years, we have endeavored to make it an improvement on the issue preceding. How far we have succeeded in this we leave our readers to judge; we prefer, rather, to utilize this space to express our gratitude to the many kind friends who have so generously done their share in providing us with the excellent articles and the artistic pictures which we have collated here.

The tables and formulæ have been carefully revised and many additional matters of importance, to both amateur and professional photographers, added.

THE EDITOR.

New York, 1895.

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## JANUARY, 1896.

**1st MONTH. 31 DAYS.**

| Day of Year. | Day of Month. | Day of Week. | N. Y. City. Sun rises. H. M. | Sun sets. H. M. |
|---|---|---|---|---|
| 1 | 1 | W | 7 25 | 4 43 |
| 2 | 2 | Th | 7 25 | 4 44 |
| 3 | 3 | F | 7 25 | 4 45 |
| 4 | 4 | Sa | 7 25 | 4 46 |
| 5 | 5 | ☉ | 7 25 | 4 47 |
| 6 | 6 | M | 7 25 | 4 48 |
| 7 | 7 | Tu | 7 25 | 4 49 |
| 8 | 8 | W | 7 24 | 4 50 |
| 9 | 9 | Th | 7 24 | 4 51 |
| 10 | 10 | F | 7 24 | 4 52 |
| 11 | 11 | Sa | 7 24 | 4 53 |
| 12 | 12 | ☉ | 7 23 | 4 54 |
| 13 | 13 | M | 7 23 | 4 55 |
| 14 | 14 | Tu | 7 23 | 4 56 |
| 15 | 15 | W | 7 22 | 4 57 |
| 16 | 16 | Th | 7 22 | 4 59 |
| 17 | 17 | F | 7 21 | 5 00 |
| 18 | 18 | Sa | 7 21 | 5 01 |
| 19 | 19 | ☉ | 7 21 | 5 02 |
| 20 | 20 | M | 7 20 | 5 03 |
| 21 | 21 | Tu | 7 19 | 5 04 |
| 22 | 22 | W | 7 18 | 5 05 |
| 23 | 23 | Th | 7 17 | 5 07 |
| 24 | 24 | F | 7 17 | 5 08 |
| 25 | 25 | Sa | 7 16 | 5 09 |
| 26 | 26 | ☉ | 7 16 | 5 10 |
| 27 | 27 | M | 7 15 | 5 11 |
| 28 | 28 | Tu | 7 14 | 5 13 |
| 29 | 29 | W | 7 13 | 5 14 |
| 30 | 30 | Th | 7 12 | 5 15 |
| 31 | 31 | F | 7 12 | 5 16 |

### Moon's Phases.

Last Q., Jan. 7, 10 h. 25 m., morn.
New M., Jan. 14, 5 h. 19 m., eve.
First Q., Jan. 22, 9 h. 42 m., eve.
Full M., Jan. 30, 3 h. 55 m., morn.

## FEBRUARY, 1896.

**2d MONTH. 29 DAYS.**

| Day of Year. | Day of Month. | Day of Week. | N. Y. City. Sun rises. H. M. | Sun sets. H. M. |
|---|---|---|---|---|
| 32 | 1 | Sa | 7 11 | 5 18 |
| 33 | 2 | ☉ | 7 10 | 5 19 |
| 34 | 3 | M | 7 09 | 5 20 |
| 35 | 4 | Tu | 7 07 | 5 21 |
| 36 | 5 | W | 7 06 | 5 22 |
| 37 | 6 | Th | 7 05 | 5 23 |
| 38 | 7 | F | 7 04 | 5 25 |
| 39 | 8 | Sa | 7 03 | 5 26 |
| 40 | 9 | ☉ | 7 02 | 5 27 |
| 41 | 10 | M | 7 01 | 5 28 |
| 42 | 11 | Tu | 7 00 | 5 30 |
| 43 | 12 | W | 6 58 | 5 31 |
| 44 | 13 | Th | 6 57 | 5 32 |
| 45 | 14 | F | 6 56 | 5 34 |
| 46 | 15 | Sa | 6 55 | 5 35 |
| 47 | 16 | ☉ | 6 53 | 5 36 |
| 48 | 17 | M | 6 52 | 5 37 |
| 49 | 18 | Tu | 6 51 | 5 39 |
| 50 | 19 | W | 6 49 | 5 40 |
| 51 | 20 | Th | 6 48 | 5 41 |
| 52 | 21 | F | 6 46 | 5 43 |
| 53 | 22 | Sa | 6 45 | 5 44 |
| 54 | 23 | ☉ | 6 44 | 5 45 |
| 55 | 24 | M | 6 42 | 5 46 |
| 56 | 25 | Tu | 6 41 | 5 48 |
| 57 | 26 | W | 6 39 | 5 49 |
| 58 | 27 | Th | 6 38 | 5 50 |
| 59 | 28 | F | 6 37 | 5 51 |
| 60 | 29 | Sa | 6 36 | 5 52 |

### Moon's Phases.

Last Q., Feb. 5, 7 h. 38 m., eve.
New M., Feb. 13, 11 h. 12 m., morn.
First Q., Feb. 21, 4 h. 14 m., eve.
Full M., Feb. 28, 2 h. 50 m., eve.

## MARCH, 1896.

**3d MONTH. 31 DAYS.**

| Day of Year. | Day of Month. | Day of Week. | N. Y. City. Sun rises. H. M. | N. Y. City. Sun sets. H. M. |
|---|---|---|---|---|
| 61 | **1** | ☽ | 6 35 | 5 53 |
| 62 | **2** | M | 6 34 | 5 53 |
| 63 | **3** | Tu | 6 32 | 5 54 |
| 64 | **4** | W | 6 30 | 5 55 |
| 65 | **5** | Th | 6 29 | 5 56 |
| 66 | **6** | F | 6 27 | 5 57 |
| 67 | **7** | Sa | 6 25 | 5 58 |
| 68 | **8** | ☽ | 6 24 | 5 59 |
| 69 | **9** | M | 6 22 | 6 00 |
| 70 | **10** | Tu | 6 20 | 6 01 |
| 71 | **11** | W | 6 19 | 6 02 |
| 72 | **12** | Th | 6 17 | 6 03 |
| 73 | **13** | F | 6 16 | 6 04 |
| 74 | **14** | Sa | 6 14 | 6 05 |
| 75 | **15** | ☽ | 6 12 | 6 06 |
| 76 | **16** | M | 6 11 | 6 08 |
| 77 | **17** | Tu | 6 09 | 6 09 |
| 78 | **18** | W | 6 07 | 6 10 |
| 79 | **19** | Th | 6 06 | 6 11 |
| 80 | **20** | F | 6 04 | 6 12 |
| 81 | **21** | Sa | 6 02 | 6 13 |
| 82 | **22** | ☽ | 6 01 | 6 14 |
| 83 | **23** | M | 5 59 | 6 15 |
| 84 | **24** | Tu | 5 58 | 6 16 |
| 85 | **25** | W | 5 56 | 6 17 |
| 86 | **26** | Th | 5 54 | 6 18 |
| 87 | **27** | F | 5 52 | 6 19 |
| 88 | **28** | Sa | 5 51 | 6 20 |
| 89 | **29** | ☽ | 5 49 | 6 21 |
| 90 | **30** | M | 5 47 | 6 22 |
| 91 | **31** | Tu | 5 45 | 6 23 |

### Moon's Phases.

Last Q., March 6, 6 h. 29 m., morn.
New M., March 14, 5 h. 48 m., morn.
First Q., March 22, 6 h. 57 m., morn.
Full M., March 29, 0 h. 21 m., morn.

## APRIL, 1896.

**4th MONTH. 30 DAYS.**

| Day of Year. | Day of Month. | Day of Week. | N. Y. City. Sun rises. H. M. | N. Y. City. Sun sets. H. M. |
|---|---|---|---|---|
| 92 | **1** | W | 5 44 | 6 24 |
| 93 | **2** | Th | 5 42 | 6 26 |
| 94 | **3** | F | 5 41 | 6 27 |
| 95 | **4** | Sa | 5 39 | 6 28 |
| 96 | **5** | ☽ | 5 37 | 6 29 |
| 97 | **6** | M | 5 36 | 6 30 |
| 98 | **7** | Tu | 5 34 | 6 31 |
| 99 | **8** | W | 5 33 | 6 32 |
| 100 | **9** | Th | 5 31 | 6 33 |
| 101 | **10** | F | 5 30 | 6 34 |
| 102 | **11** | Sa | 5 28 | 6 35 |
| 103 | **12** | ☽ | 5 26 | 6 36 |
| 104 | **13** | M | 5 25 | 6 37 |
| 105 | **14** | Tu | 5 24 | 6 38 |
| 106 | **15** | W | 5 22 | 6 39 |
| 107 | **16** | Th | 5 20 | 6 40 |
| 108 | **17** | F | 5 19 | 6 41 |
| 109 | **18** | Sa | 5 17 | 6 42 |
| 110 | **19** | ☽ | 5 16 | 6 43 |
| 111 | **20** | M | 5 14 | 6 44 |
| 112 | **21** | Tu | 5 13 | 6 45 |
| 113 | **22** | W | 5 11 | 6 46 |
| 114 | **23** | Th | 5 10 | 6 47 |
| 115 | **24** | F | 5 08 | 6 48 |
| 116 | **25** | Sa | 5 07 | 6 49 |
| 117 | **26** | | 5 06 | 6 50 |
| 118 | **27** | M | 5 04 | 6 51 |
| 119 | **28** | Tu | 5 03 | 6 52 |
| 120 | **29** | W | 5 02 | 6 53 |
| 121 | **30** | Th | 5 00 | 6 55 |

### Moon's Phases.

Last Q., April 4, 7 h. 24 m., eve.
New M., April 12, 11 h. 23 m., eve.
First Q., April 20, 5 h. 47 m., eve.
Full M., April 27, 8 h. 47 m., morn.

## MAY, 1896.

**5th MONTH. 31 DAYS.**

| Day of Year. | Day of Month. | Day of Week. | N. Y. City. Sun rises. | N. Y. City. Sun sets. |
|---|---|---|---|---|
| | | | H. M. | H. M. |
| 122 | 1 | F | 4 59 | 6 56 |
| 123 | 2 | Sa | 4 58 | 6 57 |
| 124 | 3 | § | 4 56 | 6 58 |
| 125 | 4 | M | 4 55 | 6 59 |
| 126 | 5 | Tu | 4 54 | 7 00 |
| 127 | 6 | W | 4 53 | 7 01 |
| 128 | 7 | Th | 4 52 | 7 02 |
| 129 | 8 | F | 4 51 | 7 03 |
| 130 | 9 | Sa | 4 49 | 7 04 |
| 131 | 10 | § | 4 48 | 7 05 |
| 132 | 11 | M | 4 47 | 7 06 |
| 133 | 12 | Tu | 4 46 | 7 07 |
| 134 | 13 | W | 4 45 | 7 08 |
| 135 | 14 | Th | 4 44 | 7 09 |
| 136 | 15 | F | 4 43 | 7 10 |
| 137 | 16 | Sa | 4 42 | 7 11 |
| 138 | 17 | § | 4 41 | 7 12 |
| 139 | 18 | M | 4 40 | 7 13 |
| 140 | 19 | Tu | 4 39 | 7 14 |
| 141 | 20 | W | 4 39 | 7 15 |
| 142 | 21 | Th | 4 38 | 7 16 |
| 143 | 22 | F | 4 37 | 7 17 |
| 144 | 23 | Sa | 4 36 | 7 18 |
| 145 | 24 | § | 4 36 | 7 19 |
| 146 | 25 | M | 4 35 | 7 20 |
| 147 | 26 | Tu | 4 34 | 7 20 |
| 148 | 27 | W | 4 34 | 7 21 |
| 149 | 28 | Th | 4 33 | 7 22 |
| 150 | 29 | F | 4 32 | 7 23 |
| 151 | 30 | Sa | 4 32 | 7 23 |
| 152 | 31 | § | 4 31 | 7 24 |

### Moon's Phases.

Last Q., May 4, 10 h. 25 m., morn.
New M., May 12, 2 h. 46 m., eve.
First Q., May 20, 1 h. 21 m., morn.
Full M., May 26, 4 h. 56 m., eve.

## JUNE, 1896.

**6th MONTH. 30 DAYS.**

| Day of Year. | Day of Month. | Day of Week. | N. Y. City. Sun rises. | N. Y. City. Sun sets. |
|---|---|---|---|---|
| | | | H. M. | H. M. |
| 153 | 1 | M | 4 31 | 7 24 |
| 154 | 2 | Tu | 4 30 | 7 25 |
| 155 | 3 | W | 4 30 | 7 26 |
| 156 | 4 | Th | 4 30 | 7 26 |
| 157 | 5 | F | 4 29 | 7 27 |
| 158 | 6 | Sa | 4 29 | 7 28 |
| 159 | 7 | § | 4 29 | 7 28 |
| 160 | 8 | M | 4 29 | 7 29 |
| 161 | 9 | Tu | 4 28 | 7 30 |
| 162 | 10 | W | 4 28 | 7 30 |
| 163 | 11 | Th | 4 28 | 7 31 |
| 164 | 12 | F | 4 28 | 7 31 |
| 165 | 13 | Sa | 4 28 | 7 32 |
| 166 | 14 | § | 4 28 | 7 32 |
| 167 | 15 | M | 4 28 | 7 32 |
| 168 | 16 | Tu | 4 28 | 7 33 |
| 169 | 17 | W | 4 28 | 7 33 |
| 170 | 18 | Th | 4 28 | 7 33 |
| 171 | 19 | F | 4 28 | 7 34 |
| 172 | 20 | Sa | 4 29 | 7 34 |
| 173 | 21 | § | 4 29 | 7 34 |
| 174 | 22 | M | 4 29 | 7 34 |
| 175 | 23 | Tu | 4 29 | 7 34 |
| 176 | 24 | W | 4 29 | 7 34 |
| 177 | 25 | Th | 4 30 | 7 35 |
| 178 | 26 | F | 4 30 | 7 35 |
| 179 | 27 | Sa | 4 30 | 7 35 |
| 180 | 28 | § | 4 31 | 7 35 |
| 181 | 29 | M | 4 31 | 7 35 |
| 182 | 30 | Tu | 4 32 | 7 35 |

### Moon's Phases.

Last Q., June 3, 3 h. 2 m., morn.
New M., June 11, 3 h. 43 m., morn.
First Q., June 18, 6 h. 40 m., morn.
Full M., June 25, 1 h. 55 m., morn.

# JULY, 1896.

**7th MONTH. 31 DAYS.**

| Day of Year. | Day of Month. | Day of Week. | N. Y. City. Sun rises. H. M. | N. Y. City. Sun sets. H. M. |
|---|---|---|---|---|
| 183 | **1** | W | 4 32 | 7 35 |
| 184 | **2** | Th | 4 32 | 7 35 |
| 185 | **3** | F | 4 33 | 7 34 |
| 186 | **4** | Sa | 4 33 | 7 34 |
| 187 | **5** | ☉ | 4 34 | 7 34 |
| 188 | **6** | M | 4 35 | 7 34 |
| 189 | **7** | Tu | 4 35 | 7 33 |
| 190 | **8** | W | 4 36 | 7 33 |
| 191 | **9** | Th | 4 37 | 7 33 |
| 192 | **10** | F | 4 37 | 7 32 |
| 193 | **11** | Sa | 4 38 | 7 32 |
| 194 | **12** | ☉ | 4 39 | 7 31 |
| 195 | **13** | M | 4 39 | 7 31 |
| 196 | **14** | Tu | 4 40 | 7 30 |
| 197 | **15** | W | 4 41 | 7 30 |
| 198 | **16** | Th | 4 42 | 7 29 |
| 199 | **17** | F | 4 43 | 7 29 |
| 200 | **18** | Sa | 4 44 | 7 28 |
| 201 | **19** | ☉ | 4 44 | 7 27 |
| 202 | **20** | M | 4 45 | 7 26 |
| 203 | **21** | Tu | 4 46 | 7 26 |
| 204 | **22** | W | 4 47 | 7 25 |
| 205 | **23** | Th | 4 48 | 7 24 |
| 206 | **24** | F | 4 48 | 7 23 |
| 207 | **25** | Sa | 4 49 | 7 23 |
| 208 | **26** | ☉ | 4 50 | 7 22 |
| 209 | **27** | M | 4 51 | 7 21 |
| 210 | **28** | Tu | 4 52 | 7 20 |
| 211 | **29** | W | 4 53 | 7 19 |
| 212 | **30** | Th | 4 54 | 7 18 |
| 213 | **31** | F | 4 55 | 7 17 |

## Moon's Phases.

Last Q., July 2, 8 h. 23 m., eve.
New M., July 10, 2 h. 35 m., eve.
First Q., July 17, 11 h. 4 m., morn.
Full M., July 24, 0 h. 45 m., eve.

# AUGUST, 1896.

**8th MONTH. 31 DAYS.**

| Day of Year. | Day of Month. | Day of Week. | N. Y. City. Sun rises. H. M. | N. Y. City. Sun sets. H. M. |
|---|---|---|---|---|
| 214 | **1** | Sa | 4 56 | 7 16 |
| 215 | **2** | ☉ | 4 57 | 7 14 |
| 216 | **3** | M | 4 58 | 7 13 |
| 217 | **4** | Tu | 4 59 | 7 12 |
| 218 | **5** | W | 5 00 | 7 11 |
| 219 | **6** | Th | 5 01 | 7 10 |
| 220 | **7** | F | 5 02 | 7 09 |
| 221 | **8** | Sa | 5 03 | 7 07 |
| 222 | **9** | ☉ | 5 04 | 7 06 |
| 223 | **10** | M | 5 05 | 7 05 |
| 224 | **11** | Tu | 5 06 | 7 04 |
| 225 | **12** | W | 5 07 | 7 02 |
| 226 | **13** | Th | 5 08 | 7 01 |
| 227 | **14** | F | 5 09 | 7 00 |
| 228 | **15** | Sa | 5 10 | 6 58 |
| 229 | **16** | ☉ | 5 11 | 6 57 |
| 230 | **17** | M | 5 12 | 6 55 |
| 231 | **18** | Tu | 5 13 | 6 54 |
| 232 | **19** | W | 5 14 | 6 53 |
| 233 | **20** | Th | 5 15 | 6 51 |
| 234 | **21** | F | 5 16 | 6 50 |
| 235 | **22** | Sa | 5 17 | 6 48 |
| 236 | **23** | ☉ | 5 17 | 6 47 |
| 237 | **24** | M | 5 18 | 6 45 |
| 238 | **25** | Tu | 5 19 | 6 44 |
| 239 | **26** | W | 5 20 | 6 42 |
| 240 | **27** | Th | 5 21 | 6 41 |
| 241 | **28** | F | 5 22 | 6 39 |
| 242 | **29** | Sa | 5 23 | 6 37 |
| 243 | **30** | ☉ | 5 24 | 6 36 |
| 244 | **31** | M | 5 25 | 6 34 |

## Moon's Phases.

Last Q., Aug. 1, 1 h , 34 m., eve.
New M., Aug. 9, 0 h. 2 m., morn.
First Q., Aug. 15, 4 h. 2 m., eve.
Full M., Aug. 23, 2 h. 4 m., morn.
Last Q., Aug. 31, 5 h. 55 m , morn.

## SEPTEMBER, 1896.

**9th MONTH. 30 DAYS.**

| Day of Year. | Day of Month. | Day of Week. | N. Y. City. Sun rises. H. M. | Sun sets. H. M. |
|---|---|---|---|---|
| 245 | 1 | Tu | 5 26 | 6 33 |
| 246 | 2 | W | 5 27 | 6 31 |
| 247 | 3 | Th | 5 28 | 6 29 |
| 248 | 4 | F | 5 29 | 6 28 |
| 249 | 5 | Sa | 5 30 | 6 26 |
| 250 | 6 | ☉ | 5 31 | 6 25 |
| 251 | 7 | M | 5 32 | 6 23 |
| 252 | 8 | Tu | 5 33 | 6 21 |
| 253 | 9 | W | 5 34 | 6 20 |
| 254 | 10 | Th | 5 35 | 6 18 |
| 255 | 11 | F | 5 36 | 6 16 |
| 256 | 12 | Sa | 5 37 | 6 15 |
| 257 | 13 | ☉ | 5 38 | 6 13 |
| 258 | 14 | M | 5 39 | 6 11 |
| 259 | 15 | Tu | 5 40 | 6 09 |
| 260 | 16 | W | 5 41 | 6 08 |
| 261 | 17 | Th | 5 42 | 6 06 |
| 262 | 18 | F | 5 43 | 6 04 |
| 263 | 19 | Sa | 5 44 | 6 03 |
| 264 | 20 | ☉ | 5 45 | 6 01 |
| 265 | 21 | M | 5 46 | 5 59 |
| 266 | 22 | Tu | 5 47 | 5 58 |
| 267 | 23 | W | 5 48 | 5 56 |
| 268 | 24 | Th | 5 49 | 5 55 |
| 269 | 25 | F | 5 50 | 5 53 |
| 270 | 26 | Sa | 5 51 | 5 52 |
| 271 | 27 | ☉ | 5 52 | 5 50 |
| 272 | 28 | M | 5 53 | 5 48 |
| 273 | 29 | Tu | 5 54 | 5 46 |
| 274 | 30 | W | 5 54 | 5 44 |

### Moon's Phases.

New M., Sept. 7, 8 h. 43 m., morn.
First Q., Sept. 13, 11 h. 9 m., eve.
Full M., Sept. 21, 5 h. 49 m., eve.
Last Q., Sept. 29, 8 h. 58 m., eve.

## OCTOBER, 1896.

**10th MONTH. 31 DAYS.**

| Day of Year. | Day of Month. | Day of Week. | N. Y. City. Sun rises. H. M. | Sun sets. H. M. |
|---|---|---|---|---|
| 275 | 1 | Th | 5 56 | 5 43 |
| 276 | 2 | F | 5 57 | 5 41 |
| 277 | 3 | Sa | 5 58 | 5 39 |
| 278 | 4 | ☉ | 5 59 | 5 38 |
| 279 | 5 | M | 6 00 | 5 36 |
| 280 | 6 | Tu | 6 01 | 5 35 |
| 281 | 7 | W | 6 02 | 5 33 |
| 282 | 8 | Th | 6 03 | 5 31 |
| 283 | 9 | F | 6 04 | 5 30 |
| 284 | 10 | Sa | 6 05 | 5 28 |
| 285 | 11 | ☉ | 6 07 | 5 27 |
| 286 | 12 | M | 6 08 | 5 25 |
| 287 | 13 | Tu | 6 09 | 5 23 |
| 288 | 14 | W | 6 10 | 5 22 |
| 289 | 15 | Th | 6 11 | 5 20 |
| 290 | 16 | F | 6 12 | 5 19 |
| 291 | 17 | Sa | 6 13 | 5 17 |
| 292 | 18 | ☉ | 6 14 | 5 16 |
| 293 | 19 | M | 6 15 | 5 14 |
| 294 | 20 | Tu | 6 16 | 5 13 |
| 295 | 21 | W | 6 18 | 5 12 |
| 296 | 22 | Th | 6 19 | 5 10 |
| 297 | 23 | F | 6 20 | 5 09 |
| 298 | 24 | Sa | 6 21 | 5 07 |
| 299 | 25 | ☉ | 6 22 | 5 06 |
| 300 | 26 | M | 6 23 | 5 04 |
| 301 | 27 | Tu | 6 24 | 5 03 |
| 302 | 28 | W | 6 26 | 5 02 |
| 303 | 29 | Th | 6 27 | 5 01 |
| 304 | 30 | F | 6 28 | 4 59 |
| 305 | 31 | Sa | 6 29 | 4 58 |

### Moon's Phases.

New M., Oct. 6, 5 h. 18 m., eve.
First Q., Oct. 13, 9 h. 47 m., morn.
Full M., Oct. 21, 11 h. 17 m., morn.
Last Q., Oct. 29, 10 h. 20 m., morn.

## NOVEMBER, 1896.

**11th MONTH. 30 DAYS.**

| Day of Year. | Day of Month. | Day of Week. | N. Y. City. Sun rises. H. M. | Sun sets. H. M. |
|---|---|---|---|---|
| 306 | **1** | S | 6 30 | 4 57 |
| 307 | **2** | M | 6 31 | 4 56 |
| 308 | **3** | Tu | 6 32 | 4 54 |
| 309 | **4** | W | 6 34 | 4 53 |
| 310 | **5** | Th | 6 35 | 4 52 |
| 311 | **6** | F | 6 36 | 4 51 |
| 312 | **7** | Sa | 6 37 | 4 50 |
| 313 | **8** | S | 6 38 | 4 49 |
| 314 | **9** | M | 6 40 | 4 48 |
| 315 | **10** | Tu | 6 41 | 4 47 |
| 316 | **11** | W | 6 42 | 4 46 |
| 317 | **12** | Th | 6 43 | 4 45 |
| 318 | **13** | F | 6 44 | 4 44 |
| 319 | **14** | Sa | 6 46 | 4 43 |
| 320 | **15** | S | 6 47 | 4 42 |
| 321 | **16** | M | 6 48 | 4 41 |
| 322 | **17** | Tu | 6 49 | 4 40 |
| 323 | **18** | W | 6 50 | 4 39 |
| 324 | **19** | Th | 6 51 | 4 39 |
| 325 | **20** | F | 6 53 | 4 38 |
| 326 | **21** | Sa | 6 54 | 4 38 |
| 327 | **22** | S | 6 55 | 4 37 |
| 328 | **23** | M | 6 56 | 4 36 |
| 329 | **24** | Tu | 6 57 | 4 36 |
| 330 | **25** | W | 6 58 | 4 35 |
| 331 | **26** | Th | 6 59 | 4 35 |
| 332 | **27** | F | 7 00 | 4 35 |
| 333 | **28** | Sa | 7 02 | 4 34 |
| 334 | **29** | S | 7 03 | 4 34 |
| 335 | **30** | M | 7 04 | 4 34 |

### Moon's Phases.

New M., Nov. 5, 2 h. 47 m., morn.
First Q., Nov. 12, 0 h. 40 m., morn.
Full M., Nov. 20, 5 h. 25 m., morn.
Last Q., Nov. 27, 9 h. 43 m., eve.

## DECEMBER, 1896.

**12th MONTH. 31 DAYS.**

| Day of Year. | Day of Month. | Day of Week. | N. Y. City. Sun rises. H. M. | Sun sets. H. M. |
|---|---|---|---|---|
| 336 | **1** | Tu | 7 05 | 4 34 |
| 337 | **2** | W | 7 06 | 4 33 |
| 338 | **3** | Th | 7 07 | 4 33 |
| 339 | **4** | F | 7 08 | 4 33 |
| 340 | **5** | Sa | 7 09 | 4 32 |
| 341 | **6** | S | 7 10 | 4 32 |
| 342 | **7** | M | 7 11 | 4 32 |
| 343 | **8** | Tu | 7 12 | 4 32 |
| 344 | **9** | W | 7 13 | 4 32 |
| 345 | **10** | Th | 7 14 | 4 32 |
| 346 | **11** | F | 7 15 | 4 32 |
| 347 | **12** | Sa | 7 15 | 4 32 |
| 348 | **13** | S | 7 16 | 4 33 |
| 349 | **14** | M | 7 16 | 4 33 |
| 350 | **15** | Tu | 7 17 | 4 33 |
| 351 | **16** | W | 7 18 | 4 33 |
| 352 | **17** | Th | 7 18 | 4 33 |
| 353 | **18** | F | 7 19 | 4 34 |
| 354 | **19** | Sa | 7 20 | 4 34 |
| 355 | **20** | S | 7 20 | 4 35 |
| 356 | **21** | M | 7 21 | 4 35 |
| 357 | **22** | Tu | 7 21 | 4 36 |
| 358 | **23** | W | 7 22 | 4 37 |
| 359 | **24** | Th | 7 22 | 4 37 |
| 360 | **25** | F | 7 23 | 4 38 |
| 361 | **26** | Sa | 7 23 | 4 39 |
| 362 | **27** | S | 7 23 | 4 39 |
| 363 | **28** | M | 7 23 | 4 40 |
| 364 | **29** | Tu | 7 24 | 4 40 |
| 365 | **30** | W | 7 24 | 4 41 |
| 366 | **31** | Th | 7 24 | 4 42 |

### Moon's Phases.

New M., Dec. 4, 0 h., 51 m., eve.
First Q., Dec. 11, 7 h. 28 m., eve.
Full M., Dec. 19, 11 h., 5 m., eve.
Last Q., Dec. 27, 7 h. 8 m., morn.

# REFERENCE CALENDAR FOR THREE YEARS.

## 1895

| | S | M | T | W | T | F | S |
|---|---|---|---|---|---|---|---|
| Jan. | .. | .. | 1 | 2 | 3 | 4 | 5 |
| | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
| | 20 | 21 | 22 | 23 | 24 | 25 | 26 |
| | 27 | 28 | 29 | 30 | 31 | .. | .. |
| | .. | .. | .. | .. | .. | 1 | 2 |
| Feb. | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| | 17 | 18 | 19 | 20 | 21 | 22 | 23 |
| | 24 | 25 | 26 | 27 | 28 | .. | .. |
| | .. | .. | .. | .. | .. | 1 | 2 |
| Mar. | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| | 17 | 18 | 19 | 20 | 21 | 22 | 23 |
| | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| | 31 | .. | .. | .. | .. | .. | .. |
| April | .. | 1 | 2 | 3 | 4 | 5 | 6 |
| | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
| | 28 | 29 | 30 | .. | .. | .. | .. |

| | S | M | T | W | T | F | S |
|---|---|---|---|---|---|---|---|
| May | .. | .. | .. | 1 | 2 | 3 | 4 |
| | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| | 19 | 20 | 21 | 22 | 23 | 24 | 25 |
| | 26 | 27 | 28 | 29 | 30 | 31 | .. |
| June | .. | .. | .. | .. | .. | .. | 1 |
| | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| | 16 | 17 | 18 | 19 | 20 | 21 | 22 |
| | 23 | 24 | 25 | 26 | 27 | 28 | 29 |
| | 30 | .. | .. | .. | .. | .. | .. |
| July | .. | 1 | 2 | 3 | 4 | 5 | 6 |
| | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
| | 28 | 29 | 30 | 31 | .. | .. | .. |
| Aug. | .. | .. | .. | .. | 1 | 2 | 3 |
| | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| | 25 | 26 | 27 | 28 | 29 | 30 | 31 |

| | S | M | T | W | T | F | S |
|---|---|---|---|---|---|---|---|
| Sept. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| | 15 | 16 | 17 | 18 | 19 | 20 | 21 |
| | 22 | 23 | 24 | 25 | 26 | 27 | 28 |
| | 29 | 30 | .. | .. | .. | .. | .. |
| Oct. | .. | .. | 1 | 2 | 3 | 4 | 5 |
| | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
| | 20 | 21 | 22 | 23 | 24 | 25 | 26 |
| | 27 | 28 | 29 | 30 | 31 | .. | .. |
| Nov. | .. | .. | .. | .. | .. | 1 | 2 |
| | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| | 17 | 18 | 19 | 20 | 21 | 22 | 23 |
| | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| Dec. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| | 15 | 16 | 17 | 18 | 19 | 20 | 21 |
| | 22 | 23 | 24 | 25 | 26 | 27 | 28 |
| | 29 | 30 | 31 | .. | .. | .. | .. |

## 1896

| | S | M | T | W | T | F | S |
|---|---|---|---|---|---|---|---|
| Jan. | .. | .. | .. | 1 | 2 | 3 | 4 |
| | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| | 19 | 20 | 21 | 22 | 23 | 24 | 25 |
| | 26 | 27 | 28 | 29 | 30 | 31 | .. |
| Feb. | .. | .. | .. | .. | .. | .. | 1 |
| | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| | 16 | 17 | 18 | 19 | 20 | 21 | 22 |
| | 23 | 24 | 25 | 26 | 27 | 28 | 29 |
| Mar. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| | 15 | 16 | 17 | 18 | 19 | 20 | 21 |
| | 22 | 23 | 24 | 25 | 26 | 27 | 28 |
| | 29 | 30 | 31 | .. | .. | .. | .. |
| April | .. | .. | .. | 1 | 2 | 3 | 4 |
| | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| | 19 | 20 | 21 | 22 | 23 | 24 | 25 |
| | 26 | 27 | 28 | 29 | 30 | .. | .. |
| | .. | .. | .. | .. | .. | .. | .. |

| | S | M | T | W | T | F | S |
|---|---|---|---|---|---|---|---|
| May | .. | .. | .. | .. | .. | 1 | 2 |
| | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| | 17 | 18 | 19 | 20 | 21 | 22 | 23 |
| | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| | 31 | .. | .. | .. | .. | .. | .. |
| June | .. | 1 | 2 | 3 | 4 | 5 | 6 |
| | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
| | 28 | 29 | 30 | .. | .. | .. | .. |
| July | .. | .. | .. | 1 | 2 | 3 | 4 |
| | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| | 19 | 20 | 21 | 22 | 23 | 24 | 25 |
| | 26 | 27 | 28 | 29 | 30 | 31 | .. |
| Aug. | .. | .. | .. | .. | .. | .. | 1 |
| | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| | 16 | 17 | 18 | 19 | 20 | 21 | 22 |
| | 23 | 24 | 25 | 26 | 27 | 28 | 29 |
| | 30 | 31 | .. | .. | .. | .. | .. |

| | S | M | T | W | T | F | S |
|---|---|---|---|---|---|---|---|
| Sept. | .. | .. | 1 | 2 | 3 | 4 | 5 |
| | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
| | 20 | 21 | 22 | 23 | 24 | 25 | 26 |
| | 27 | 28 | 29 | 30 | .. | .. | .. |
| Oct. | .. | .. | .. | .. | 1 | 2 | 3 |
| | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| | 25 | 26 | 27 | 28 | 29 | 30 | 31 |
| Nov. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| | 15 | 16 | 17 | 18 | 19 | 20 | 21 |
| | 22 | 23 | 24 | 25 | 26 | 27 | 28 |
| | 29 | 30 | .. | .. | .. | .. | .. |
| Dec. | .. | .. | 1 | 2 | 3 | 4 | 5 |
| | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
| | 20 | 21 | 22 | 23 | 24 | 25 | 26 |
| | 27 | 28 | 29 | 30 | 31 | .. | .. |
| | .. | .. | .. | .. | .. | .. | .. |

## 1897

| | S | M | T | W | T | F | S |
|---|---|---|---|---|---|---|---|
| Jan. | .. | .. | .. | .. | .. | 1 | 2 |
| | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| | 17 | 18 | 19 | 20 | 21 | 22 | 23 |
| | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| | 31 | .. | .. | .. | .. | .. | .. |
| Feb. | .. | 1 | 2 | 3 | 4 | 5 | 6 |
| | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
| | 28 | .. | .. | .. | .. | .. | .. |
| Mar. | .. | 1 | 2 | 3 | 4 | 5 | 6 |
| | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
| | 28 | 29 | 30 | 31 | .. | .. | .. |
| April | .. | .. | .. | .. | 1 | 2 | 3 |
| | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| | 25 | 26 | 27 | 28 | 29 | 30 | .. |

| | S | M | T | W | T | F | S |
|---|---|---|---|---|---|---|---|
| May | .. | .. | .. | .. | .. | .. | 1 |
| | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| | 16 | 17 | 18 | 19 | 20 | 21 | 22 |
| | 23 | 24 | 25 | 26 | 27 | 28 | 29 |
| | 30 | 31 | .. | .. | .. | .. | .. |
| June | .. | .. | 1 | 2 | 3 | 4 | 5 |
| | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
| | 20 | 21 | 22 | 23 | 24 | 25 | 26 |
| | 27 | 28 | 29 | 30 | .. | .. | .. |
| July | .. | .. | .. | .. | 1 | 2 | 3 |
| | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| | 25 | 26 | 27 | 28 | 29 | 30 | 31 |
| Aug. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| | 15 | 16 | 17 | 12 | 19 | 20 | 21 |
| | 22 | 26 | 24 | 25 | 26 | 27 | 28 |
| | 29 | 30 | 31 | .. | .. | .. | .. |

| | S | M | T | W | T | F | S |
|---|---|---|---|---|---|---|---|
| Sept. | .. | .. | .. | 1 | 2 | 3 | 4 |
| | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| | 19 | 20 | 21 | 22 | 23 | 24 | 25 |
| | 26 | 27 | 28 | 29 | 30 | .. | .. |
| Oct. | .. | .. | .. | .. | .. | 1 | 2 |
| | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| | 17 | 18 | 19 | 20 | 21 | 22 | 23 |
| | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| | 31 | .. | .. | .. | .. | .. | .. |
| Nov. | .. | 1 | 2 | 3 | 4 | 5 | 6 |
| | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
| | 28 | 29 | 30 | .. | .. | .. | .. |
| Dec. | .. | .. | .. | 1 | 2 | 3 | 4 |
| | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| | 19 | 20 | 21 | 22 | 23 | 24 | 25 |
| | 26 | 27 | 28 | 29 | 30 | 31 | .. |

## ECLIPSES IN 1896.

NOTE.—*Local mean time for the latitude of New York City is used in reckoning eclipses, sunset and sunrise. Subtract four minutes to change the reckoning to Eastern standard time of 75th meridian.*

*Moon's phases are calculated for Eastern standard time. "Morn." is understood to extend from Midnight to Noon. "Eve." from Noon to Midnight.*

There will be four Eclipses this year, two each of the Sun and Moon, as follows:

I.—*An annular eclipse of the Sun*, February 13, invisible in the United States; visible in Africa, South America and the Southern Atlantic Ocean.

II.—*A partial eclipse of the Moon*, February 28, invisible in America.

III.—*A total eclipse of the Sun*, August 28, visible in North Asia, Europe, British America, Greenland and Alaska.

IV.—*A partial eclipse of the Moon*, August 23, visible throughout North and South America. Size, 8.8 digits.

## THE SEASONS.

| | | | |
|---|---|---|---|
| SPRING begins..... | March 20, 3 p.m. | AUTUMN begins..... | September 23, 2 a.m. |
| SUMMER begins..... | June 21, noon. | WINTER begins.. | December 21, 9 p.m. |

## CHURCH DAYS.

| | | | |
|---|---|---|---|
| Septuagesima ..... | Feb. 2 | Easter Sunday ..... | April 5 |
| Sexagesima..... | Feb. 9 | Low Sunday. ..... | April 12 |
| Quinquagesima..... | Feb. 16 | Rogation Sunday... | May 10 |
| Shrove Tuesday.... | Feb. 18 | Ascension Day ..... | May 14 |
| Ash Wednesday.... | Feb. 19 | Whitsunday (Pent.). | May 24 |
| Quadragesima..... | Feb. 23 | Trinity Sunday. ... | May 31 |
| Palm Sunday ..... | March 29 | Corpus Christi . .. | June 4 |
| Good Friday..... | April 3 | Advent Sunday .... | Nov. 29 |

## CHRONOLOGICAL CYCLES.

| | |
|---|---|
| Dominical Letter..... | ED |
| Epact ..... | 15 |
| Golden Number (Lunar Cycle)..... | 16 |
| Solar Cycle..... | 1 |
| Roman Indiction..... | 9 |
| Julian Period..... | 6609 |

## CHRONOLOGICAL ERAS.

The year 1896, which comprises the latter part of the 120th and the beginning of the 121st year of the INDEPENDENCE OF THE UNITED STATES OF AMERICA, corresponds to the year 6609 of the JULIAN PERIOD; the years 7404-7405 of the BYZANTINE ERA; the years 5656-57 of the JEWISH ERA; the year 2649 since the FOUNDATION OF ROME, according to Varro; the year 2672 of the OLYMPIADS; the year 1612 of the era of DIOCLETIAN; the year 2556 of the JAPANESE ERA; the years 1313-14 of the MOHAMMEDAN ERA.

The 1st day of January of the year 1896 is the 2,413,560th day since the commencement of the JULIAN PERIOD.

The JULIAN CALENDAR, which is still used in the Russian Empire, dates twelve days back of our own—the GREGORIAN CALENDAR. Thus a letter from St. Petersburg dated January 1st was really written on January 13th.

The Russians generally use, in official documents and frequently in business correspondence, two dates, which they call "old style" and "new style"; and in Alaska three dates have been used on their documents, because the early navigators forgot to make allowance for the crossing of the 180th meridian in sailing from Siberia to North America.

## LEGAL HOLIDAYS IN THE VARIOUS STATES.

JAN. 1. NEW YEAR'S DAY; In all States except Massachusetts, New Hampshire and Rhode Island.

JAN. 8. ANNIVERSARY OF THE BATTLE OF NEW ORLEANS: In Louisiana.

JAN. 19. LEE'S BIRTHDAY: In Georgia, North Carolina and Virginia.

FEB. 12. LINCOLN'S BIRTHDAY: In Illinois.

FEB. 22. WASHINGTON'S BIRTHDAY: In all States except Arkansas, Iowa and Mississippi.

FEB. 20. MARDI-GRAS: In Alabama and Louisiana.

MARCH 2. ANNIVERSARY OF TEXAN INDEPENDENCE: In Texas.

MARCH 4. FIREMEN'S ANNIVERSARY: In New Orleans, La.

APRIL 3. GOOD FRIDAY: In Alabama, Louisiana, Maryland, Pennsylvania and Tennessee.

APRIL 19. PATRIOTS' DAY: In Massachusetts.

APRIL 21. ANNIVERSARY OF THE BATTLE OF SAN JACINTO: In Texas.

APRIL 26. MEMORIAL DAY: In Alabama and Georgia.

MAY 10. MEMORIAL DAY: In North Carolina.

MAY 20. ANNIVERSARY OF THE SIGNING OF THE MECKLENBURG DECLARATION OF INDEPENDENCE: In North Carolina.

MAY 30. DECORATION DAY: In Arizona, California, Colorado, Connecticut, Delaware, District of Columbia, Iowa, Illinois, Indiana, Kansas, Maine, Maryland, Massachusetts, Michigan, Minnesota, Montana, Nebraska, Nevada, New Hampshire, New Jersey, New York, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, Tennessee, Utah, Vermont, Wisconsin, Washington and Wyoming.

JUNE 3. JEFFERSON DAVIS'S BIRTHDAY: In Florida.

JUNE 17. BATTLE OF BUNKER HILL: In Boston, Mass.

JULY 4. INDEPENDENCE DAY: In all States.

JULY 24. PIONEER'S DAY: In Utah.

SEPT. 7. LABOR DAY: In Alabama, California, Colorado, Connecticut, Delaware, Florida, Georgia, Illinois, Indiana, Iowa, Kansas, Maine, Maryland, Massachusetts, Michigan, Montana, Nebraska, New Hampshire, New Jersey, New York.

Ohio, Oregon, Pennsylvania, South Carolina, South Dakota, Tennessee, Texas, Utah, Virginia and Washington.

SEPT. 9. ADMISSION DAY: In California.

SEPT. 12. LABOR DAY: In Florida

OCT. 31. ADMISSION DAY: In Nevada

NOV. 3. GENERAL ELECTION DAY: In Arizona, California, Idaho, Indiana, Kansas, Maryland, Minnesota, Missouri, Montana, Nevada, New Hampshire, New Jersey, New York, North Dakota, Ohio, Pennsylvania, South Carolina, South Dakota, Tennessee, Texas, West Virginia, Washington, Wisconsin and Wyoming.

NOV. 25 LABOR DAY: In Louisiana.

NOV. 26. THANKSGIVING DAY: In all States, though in some it is not a statutory holiday.

DEC 25. CHRISTMAS DAY In all States; in South Carolina, the two succeeding days in addition.

SUNDAYS AND FAST DAYS are legal holidays in all States, which designate them as such.

ARBOR DAY is a legal holiday in Kansas, North Dakota, Rhode Island and Wyoming, the day being set by the Governor—in Nebraska, April 22; California, September 9; Colorado, third Friday in April; Montana, third Tuesday in April; Utah, first Saturday in April; Idaho, Friday after May 1.

EVERY SATURDAY after 12o'clock noon is a legal holiday in New York, New Jersey, New Orleans, Pennsylvania and Maryland; and from June 1 to September 30 in New Castle Co., Del.

THERE are no national holidays, not even the Fourth of July. Congress has at various times appointed special holidays. In the second session of the Fifty-third Congress, it passed an act making Labor Day a public holiday in the District of Columbia; and it has recognized the existence of certain days as holidays, for commercial purposes, in such legislation as the Bankruptcy act, but with the exception named, there is no general statute on the subject. The proclamation of the President designating a day of thanks giving only, makes it a holiday in those States which provide by law for it.

## UNITED STATES AND TERRITORIES.

| States and Territories. | Estimated Populat'n. | Capitals. | States and Territories. | Estimated Populat'n. | Capitals. |
|---|---|---|---|---|---|
| Alabama | 1,600,000 | Montgomery. | Montana | 185,000 | Helena. |
| Alaska Terr | 32,000 | Sitka. | Nebraska | 1,250,000 | Lincoln. |
| Arizona Terr | 68,000 | Phœnix. | Nevada | 44,000 | Carson City. |
| Arkansas | 1,300,000 | Liitle Rock. | New Hampshire. | 385,000 | Concord. |
| California | 1,350,000 | Sacramento. | New Jersey | 1,689,400 | Trenton. |
| Colorado | 425,000 | Denver. | New Mexico T. | 190,000 | Santa Fé. |
| Connecticut | 790,000 | Hartford. | New York | 6,690,842 | Albany. |
| Delaware | 179,700 | Dover. | North Carolina. | 1,700,000 | Raleigh. |
| Dist. Columbia | 280,000 | Washington. | North Dakota | 200,000 | Bismark. |
| Florida | 425,000 | Tallahassee. | Ohio | 3,825,000 | Columbus. |
| Georgia | 1,956,000 | Atlanta. | Oklahoma Terr. | 250,000 | Guthrie. |
| Idaho | 125,000 | Boise City. | Oregon | 350,000 | Salem |
| Illinois | 4,500,000 | Springfield. | Pennsylvania | 5,745,574 | Harrisburg. |
| Indiana | 2,406.504 | Indianapolis. | Rhode Island | 375,000 | Providence. |
| Iowa | 2,010,000 | Des Moines | South Carolina. | 1,270.000 | Columbia. |
| Kansas | 1,450,000 | Topeka. | South Dakota | 390,000 | Pierre. |
| Kentucky | 2,000,000 | Frankfort. | Tennessee | 1,800.000 | Nashville. |
| Louisiana | 1,200,000 | Baton Rouge. | Texas | 2,650,000 | Austin. |
| Maine | 722,000 | Augusta. | Utah Terr | 252,834 | Salt Lake City. |
| Maryland | 1,122,890 | Annapolis. | Vermont | 337,000 | Montpelier. |
| Massachusetts | 2,472,749 | Boston. | Virginia | 1,750.000 | Richmond. |
| Michigan | 2,241,500 | Lansing. | Washington | 395,589 | Olympia. |
| Minnesota | 1,500,000 | St. Paul. | West Virginia | 857,325 | Charleston. |
| Mississippi | 1,352,800 | Jackson. | Wisconsin | 2,000,000 | Madison. |
| Missouri | 3,000,000 | Jefferson City. | Wyoming | 80,000 | Cheyenne. |

Grand Total, 1895 ..... 69,171,707

## DIFFERENCE IN TIME (FOR CABLE PURPOSES).

BETWEEN NEW YORK AND SOME OF THE PRINCIPAL COMMERCIAL CITIES OF THE WORLD.

This Table is Approximate; the odd seconds are not given.

| | H.M. | | H.M. | | H.M. | | H.M. |
|---|---|---|---|---|---|---|---|
| Aden | 7.56 F | Brussels | 5.14 F | Gibraltar | 4.35 F | Moscow | 7.25 F |
| Alexandria | 6.56 F | Buenos Ayres. | 1.02 F | Greenwich | 4.56 F | Panama | .12 S |
| Algiers | 5.08 F | Cadiz | 4.27 F | Hamburg | 5.36 F | Paris | 5.02 F |
| Amsterdam | 5.16 F | Calcutta | 10.50 F | Havana | .33 S | Rio de Janeiro. | 2.03 F |
| Antwerp | 5.13 F | Canton | 11.31 S | Hong Kong | 11.27 S | Rome | 5.46 F |
| Athens | 6.31 F | Cape Town | 6.10 F | Lisbon | 4.19 F | St. Petersburg. | 6.57 F |
| Bahia | 2.34 F | Christiana | 5.39 F | Liverpool | 4.44 F | Stockholm | 6.08 F |
| Berlin | 5.50 F | Constantinople | 6.53 F | London | 4.56 F | Sydney | 9.59 F |
| Berne | 5.26 F | Copenhagen | 5.46 F | Madrid | 4.42 F | Valparaiso | .10 F |
| Bombay | 9.48 F | Dublin | 4.31 F | Melbourne | 9.14 F | Vera Cruz | 1.29 S |
| Bordeaux | 4.53 F | Edinburgh | 4.43 F | Mexico City | 1.40 S | Vienna | 6.01 F |
| Bremen | 5.31 F | Geneva | 5.21 F | Montevideo | 1.11 F | Yokohama | 10.45 S |

F—*Fast of N. Y. Time.* S—*Slow of N. Y. Time.*

The difference in time is calculated on actual New York Mean Time, 74° of longitude west of Greenwich. For the new Standard Time, 75th Meridian west of Greenwich, for places west of New York, subtract 4 minutes; for places east of New York, add 4 minutes.



PHOTOCHROME ENG. CO., N. Y.

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"EDITH,"

BY B. J. FALK.

# The American Annual of Photography and Photographic Times Almanac for 1896.

## BE EARNEST.

BY MAX MADDER.



By C. Baer.

FEW photographers appear to practice the art of picture-making with any earnest endeavor to ascend above the commonplace. If the results are fair and admired by their friends, they are satisfied. How few there are, it seems to me, who realize the possibilities of the camera. To the man with artistic feeling, who has never received the necessary education to become expert with the pencil or brush, it should prove an invaluable instrument. To master the technical difficulties should not require any great length of time, and if he will then endeavor to make use of his artistic abilities, using the camera only as a means to an end, he will succeed in obtaining results showing evidence of his own individuality, and not mere commonplace views of scenery with which the world is now flooded.

There are many thousands of photographers in this country, both amateur and professional, but only a few, hardly a dozen, have succeeded in producing results showing the highest capabilities of the photographic art.

The professional photographer of to-day is the professional photographer of yesterday and to-morrow. He has fallen into the old time-worn path from which he hardly, if ever, deviates. Many never look at a photographic magazine. In their conceited imagination they think they know it all, whereas, beyond the rule of thumb work necessary to make a studio portrait, they know nothing.

To the amateur or professional photographer I want to offer a word of advice. Be earnest in your work. Any fool can make the ordinary photograph, but the artist is the man who will produce results breathing his own individuality and exciting in the minds of the beholders those high feelings which we find with the work of the greater artists.



By Harry and Marie Platt.

A SNOW WHITE PEACE IS IN THE SILENT AIR.

# PHOTOGRAPHIC RECORD OF SOUND-ANALYSIS.

BY PROF. WILLIAM HALLOCK
(Columbia College).

WE are to-day so familiar with the permanent records of sounds as furnished by the phonograph, that it would at first appear superfluous to try any other method, but the phonograph can only repeat, and cannot analyze a sound. Dr. Floyd S. Muckey and myself having undertaken an investigation of the subject of voice production and voice analysis, desired to use the well-known reson-

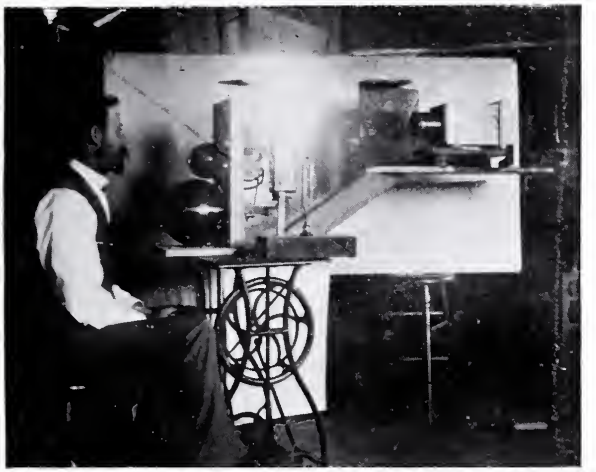


FIG. 1.

ators of Konig and Helmholtz, with their manometric capsules, and wished a record in black and white, entirely free from personal influences. We were consequently unwilling to sketch what we thought we saw, as Konig did; we wished a photograph of what was actually taking place. Thus it became necessary to photograph eight small round gas flames about ¾ inch high, which were jumping up and down at rates between 128 and 1024 times per second. Professor Merrit, of Cornell, photographed one flame which had been surrounded with oxygen to make it more actinic, but we did not care to bother with oxygen around eight flames, and do not need it with our present combination of

lens and plates. In order to know what these little flames are doing, one instantaneous exposure will not suffice; the image of the flame must move across the plate, so that it will trace a wavy line if it is going up and down. This we accomplished by mounting the whole camera upon a board which is pivoted under the center of the lens. The eight



FIG. 2.

flames are arranged one above the other. See Fig. 3. The camera having been pointed at the flames and focused, it is pointed at a dead black screen at the left of the flames (removed in Fig. 1), the plate-holder is put in place and the slide removed. When all is ready the camera is quickly swung round until it points at a screen on the right of the flames, and the slide replaced in the holder. During the

swing the images of the eight flames swept across the plate, and left their record, a wavy line if they were jumping, a smooth one if they were quiet. See Figs. 5–9.

When a person sings a good open "ah" on the pitch of "bass C," there should also be present in the voice, "middle

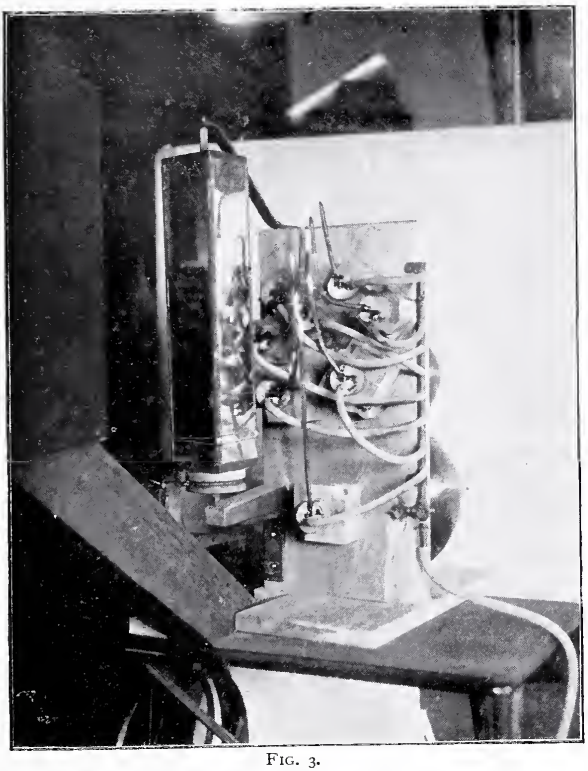


FIG. 3.

c and g," and "treble c, e, g and b," and "high C," as "overtones" or "harmonics." See Fig. 5. Upon the relative strength of these eight tones depends the individual character of the voice; compare Figs. 5 and 7, and 6 and 8, as well as the vowel sound produced; compare Figs. 5 and 6, and 7 and 8. It was our problem to record the presence or absence of these eight tones and their relative strength when various people sang the different vowels upon the pitch of bass C. We made a set of Konig resonators tuned to the above harmonics of base C, and fitted each with a manometric capsule,

as shown in Fig. 4. A is the resonator proper with its mouth at B, and nipple at C. The capsule consists of the round plug G, with its end turned hollow and covered with a very thin rubber diaphragm at D. Gas enters the tube E, passing behind the rubber head and out the other tube, and burning in the little flame at F. P is the plank upon which the whole is mounted. Every resonator has a particular note which it can reinforce, to which it will "respond." Supposing it is a $C_4$ resonator, treble C, then whenever $C_4$ is

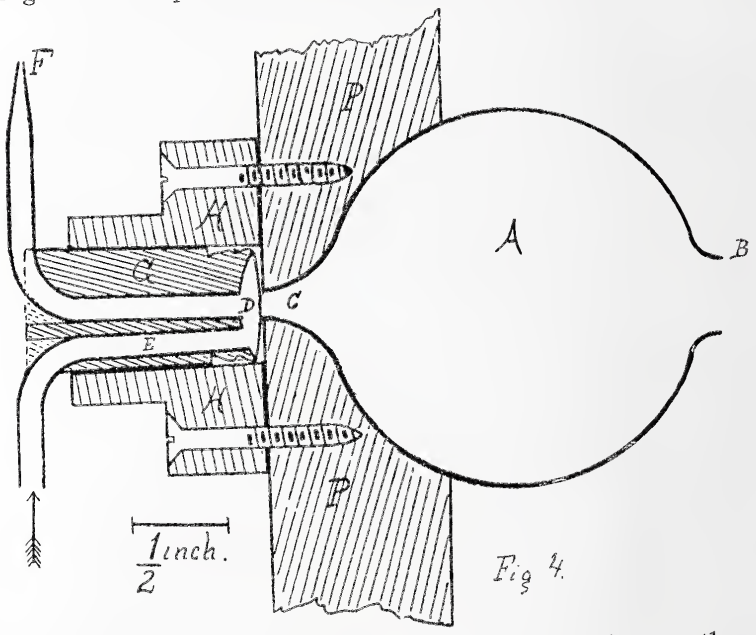



Fig. 4.

sounded the air in A will take up the note and cause the rubber at D to vibrate, and that will make the little flame F jump up and down. This will be true no matter what notes are sounded with $C_4$, and no combination of tones can make that flame jump unless $C_4$ is among them.

Fig. 2 shows the fronts of the resonators; Fig. 3 the capsules and flames, and Fig. 1 illustrates the general arrangement of singer, resonators, capsules and camera. A person sings before the apparatus, the photograph is taken, and the

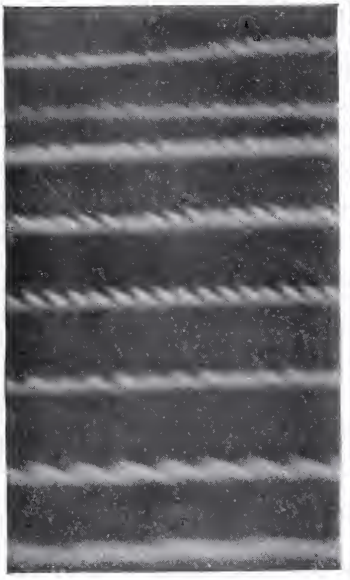


FIG. 5.

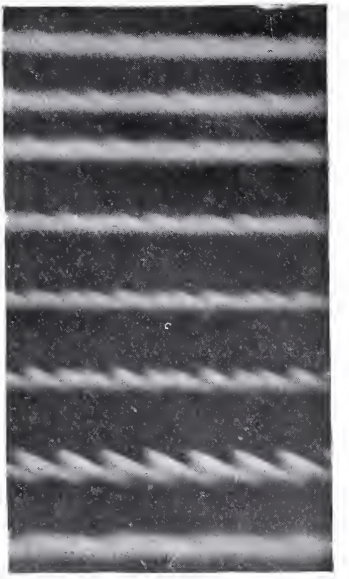


FIG. 6.

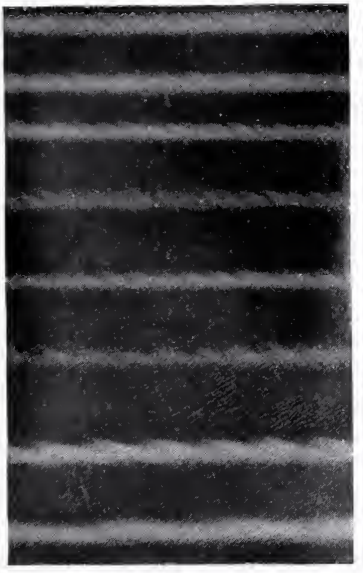


FIG. 7.

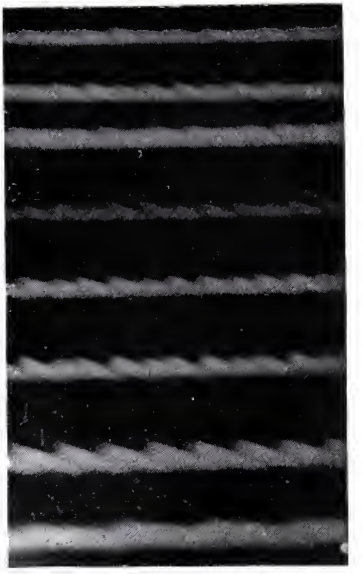


FIG. 8.

negative will tell which harmonics were present and how strong.

In Figs. 5 and 7 all eight resonators are responding, but the relative activity is different in the two plates. Note the difference in the upper harmonics when the vowels A and E are sung (Figs. 5 and 6, and 7 and 8); also, how when the tone is forced to loudness (Fig. 9), the medium over-tones drown and choke out the upper ones, thus reducing the richness of the voice. These eight flames are vibrating at the following

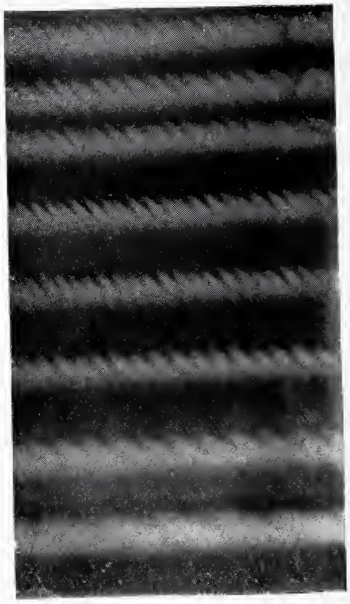


FIG. 9.

rate per second: $C_2$–128, $c_3$–256, $g_3$–384, $c_4$–512, $e_4$–640, $g_4$–768, "No. 7"–896, $c_5$–1024.

At first we used a 5 x 7 lens, by A. Lavern, but we now have an old portrait combination of 3-inch aperture by W. & W. H. Lewis. We did get fair records with a 50-cent plano-convex lens of 3-inch aperture and 7-inch focus. The Cramer instantaneous isochromatic plates with an eikonogen-hydrochinon developer have enabled us, without difficulty, to catch the movements of our little flames in the thousandth of a second.

Two such capsules mounted near two sources of sound



The Climax Photo Engraving Co. Miss Morse.

"WHERE ARE YOU GOING TO,
MY PRETTY MAID."
BY A. MORENO.

enable one by photographing the flames to determine the relative pitch with great accuracy and ease, and perhaps other uses will be found for an operation at once simple and accurate.

## FORTY-SIX YEARS UNDER THE SKYLIGHT.

BY PROF. DAVID P. TODD
(*Amherst College*).

IN the present day of perfection in photographic processes, and the ease with which effects are obtained, it is hard to realize how short a time ago everything was new, not well understood, and clumsy to operate. Our present marvelous facilities are due to the patient experiments of a few practical photographers and chemists who worked for years along lines seeming to promise success in mechanical manipulation. Few, very few, of these Nestors in photography who, beginning with the primitive daguerreotype, followed every improvement through succeeding years to the first rank among modern, progressive photographers, are still living; and no one of them is more worthy of special notice than Mr. J. L. Lovell, of Amherst, Massachusetts.



J. L. LOVELL.
Chief Photographer of the Lick Observatory for the Transit of Venus, 1882.

Now nearly a half century a practical photographer, his fine work is thoroughly well known. Beginning to practice the new art of daguerreotyping at Ware in 1849, he removed after three years to Brattleboro, where he remained four years. Among the eminent persons who sat to him during this time were Henry Ward Beecher, then on one of his lecture tours, and Governor Holbrook; while he made also

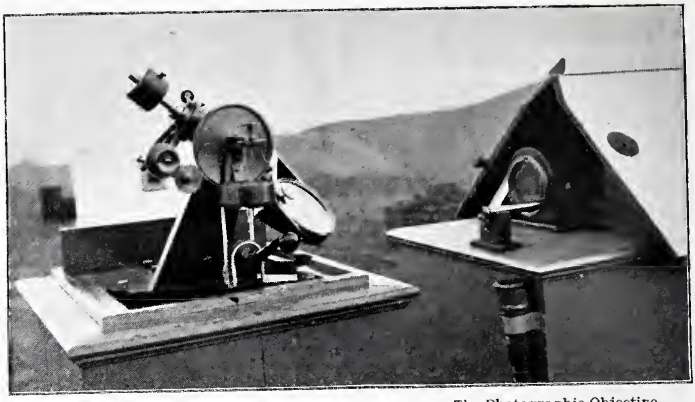
a large number of studies for Larkin G. Mead, the sculptor (a brother of Mrs. William D. Howells), who was just beginning his now famous work.

In 1854, thinking that he needed more actual instruction in the fast-growing art than his own experience could supply, Mr. Lovell left Brattleboro', and went to Boston, to learn from Messrs. Whipple and Black, pioneers with himself of photography in New England, the very latest and best improvements. There were, outside of Boston at that time, but two photographers in Massachusetts; and Mr. Lovell was rapidly laying the foundation for that thoroughness in workmanship and method which have always been so well embodied in his pictures.

About this time he happened to meet Dr. Dean, of Greenfield, a noted surgeon who, deeply interested in geology, was arranging for the publication by the Smithsonian Institution of a work relating to that most fertile subject—the geology of the Connecticut Valley. Needing photographs to illustrate the volume, he was delighted to find in Mr. Lovell just the man for his purpose; and during three years the pictures were taken, up and down the Valley, using Amherst with its fine cabinet collections, as the basis. This book, of which an edition of 300 was published, is now out of print, and exceedingly rare; but it ranks among the very first American books illustrated by actual photographs. A much more complete and scientific work was issued soon after by the late President Hitchcock, of Amherst College, for which Mr. Lovell made several thousand photographs.

Among the interesting objects in his studio connected with these early years, Mr. Lovell shows a quaint daguerreotype of Jenny Lind, taken just after her marriage with Otto Goldschmidt, who artlessly encircles her waist with his arm in the picture. Life was certainly simpler in those days than now.

The first *cartes de visite* came to this country from Paris in 1861, and Mr. Lovell at once began to make them, using plain paper. There were no mounts, and he had to make his own. With the introduction of albumenized paper and a reduced price, the popularity of photographs grew rapidly,



The Reflecting Heliostat. The Photographic Objective.

THE TRANSIT OF VENUS 1892. PHOTOGRAPHED AT THE LICK OBSERVATORY.

and when the carbon process was introduced, in 1866, Mr. Lovell at once took an active interest in this new departure, and the great number of his prints and enlargements of this era are now as fresh as when made, the fading of nearly thirty years being quite imperceptible. Near the daguerreotype of Jenny Lind, hangs in Mr. Lovell's studio a portrait of Dr. Mark Hopkins, late President of Williams College.

The pictures for the Amherst College Exhibit at the New Orleans Exposition in 1885 were made by him; and for Williston Seminary and the State Agricultural College at the Centennial Exposition in 1876.

When in 1882 the Trustees of the Lick Observatory invited me to take charge of the observations of the transit of Venus, in December of that year, I appointed Mr. Lovell as chief photographer of the Expedition. The Observatory and its apparatus were then very incomplete; but the weather on the day of the transit was perfect, and 145 photographs were taken, at all stages of the planet's passage across the sun. We used the wet collodion process, and the photographs obtained by Mr. Lovell, assisted by Messrs. Flagler and Loryea, have been pronounced by expert astronomers the finest ever made of a transit of Venus. An enlargement from the best negative in the series received especial mention in the diploma awarded to the Amherst

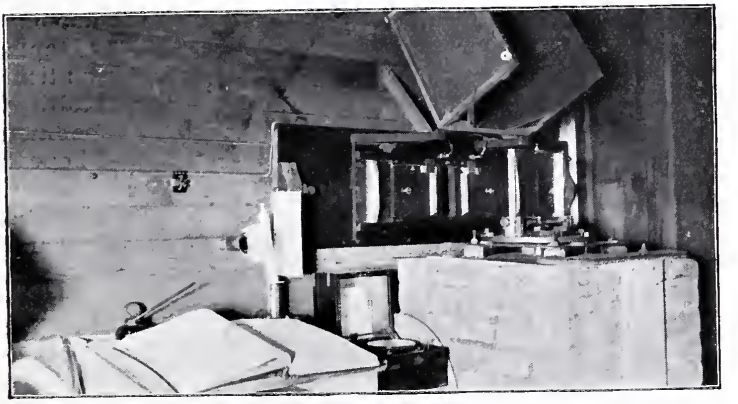


Transit House. 40 feet Photoheliograph. Dark-room.

THE TRANSIT OF VENUS, 1892. PHOTOGRAPHED AT LICK OBSERVATORY.

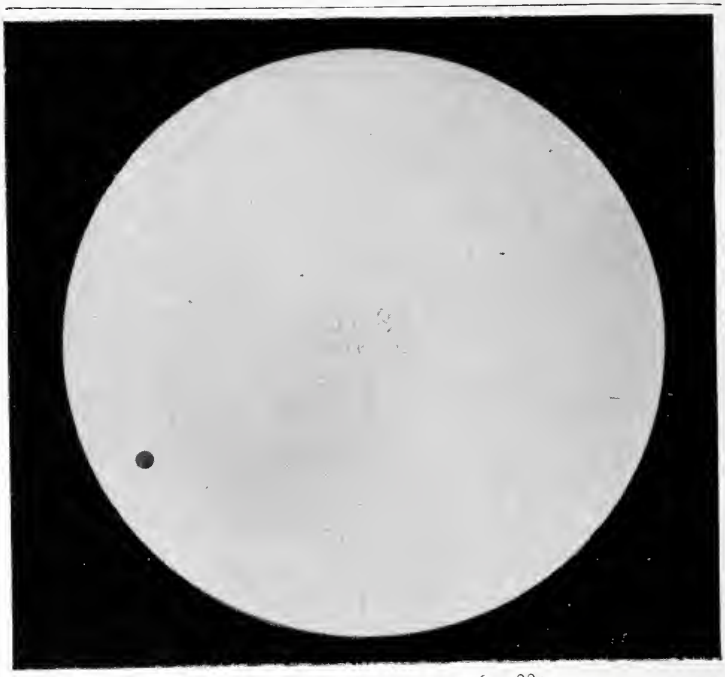
College Exhibit at the Columbian Exposition, Chicago, 1893. They may well remain the finest for several generations, as no other transit of Venus can occur until the year 2004.

About the time of his return from Mount Hamilton, the dry-plate process just coming into general use, Mr. Lovell began the manufacture of these plates, both for himself and others, and he made the first dry-plate negative produced in this part of New England. His unsurpassed skill in all the technique of photography, from the manufacture of plates



Interior of dark-room. Record book. Chronometer Exposing slide. Reticule plate holder.

THE TRANSIT OF VENUS, 1892. PHOTOGRAPHED AT LICK OBSERVATORY.



THE TRANSIT OF VENUS, DEC. 6, 1882.
As Photographed at the Lick Observatory by J. L. Lovell.

onward, renders his service of particular value on expeditions to foreign lands, where usually there are no resources to rely on save one's own. I offered Mr. Lovell the appointment of photographer-in-chief of my Expedition to Japan in 1887, and to Africa in 1889–90; and these expeditions suffered much from his inability, on account of the health of his family, to accept these appointments. On my expedition next year, for the total eclipse of 9th of August, 1896, I hope to be fortunate enough to have his invaluable assistance once more.

Mr. Lovell has been class-photographer for many institutions and colleges, most of them in many successive years; among them are Williston Seminary and Wilbraham Academy, Dartmouth, Williams, and Amherst Colleges.

His outdoor views are of peculiar excellence, and they have done much to render the beauties of Amherst scenery and its vicinity known and loved throughout America. To the alumni of the college returning to Amherst, he is one of the "institutions" of the town; and his zeal and enthu-

siasm for new and better methods in his profession are no less in these later years than they were when in his youth he adopted "daguerreotyping," and all that might develop from it, as his foster mother.

## PHOTOGRAMMETRY AND TELEPHOTOGRAPHY.*

BY ALBERT GLEAVES
*(Lt. U. S. Navy).*



John Roesch.

THESE two fields of photography are rich in possibilities, and although they have been, for a number of years, under scientific investigation in France and Germany, they have not received in this country the serious attention they deserve.

Photogrammetry, or the art of measuring by means of photography, dates from 1858. The history of its origin is clouded with polemics of rival claimants, the Germans asserting that the honor of its discovery belongs to Dr. Meyenbauer, who first recommended its application to architecture, while the French, on the other hand, consider Colonel Laussedat the inventor of this method of scientific measurement.

Photogrammetry is best known in its application to geodetic surveys; but the Germans, with their keen sense for subtile investigations, have expanded its sphere of usefulness to researches in dynamic phenomena, and by its means have detected and recorded the vibrations of bridges, the motions of railroad trains, the weak points in tracks, the speed of fly-wheels, etc., etc. They have also photographed, so to speak, the velocity of river currents, and measured the length, height and period of waves. The general method of procedure is the same in all these observations; the point to be

* See "Mittheilungen aus dem Gebiete Des Seewesens," for 1894, Vol. XXII., No. X., "Die Fortschritte der Photogrammetrie," von Prof. F. Schiffner, in Wien; and also the *Revue du Cercle Militaire*, January and February, 1895, Nos. 3, 4, 5, 6, "La Photographie à Grande Distance." A. G.

observed is lighted by a mirror, and its motion is photographed on a sensitized cylinder or plate which is actuated by clockwork. In the case of the current the observations are made at night; three points along the river bank are illuminated, and a light, such perhaps as the Holmes inextinguishable signal light, is floated down the river. The movement of this point of light, between the three fixed points, is suitably photographed; knowing the distance between the points and the time of transit of the float, the velocity is readily calculated. One wonders, however, why so much trouble is taken to accomplish what could be done offhand in many ways and with equal accuracy.

The number of types of photogrammetric cameras in the foreign market is legion. The simplest, perhaps, is that designed by Commandant Legros, and described by him in a little brochure recently published in Paris. M. Legros makes no claim to originality; he frankly asserts that he has taken other people's ideas, condensed them, and applied them in such a way that the ordinary camera of commerce can, at small expense, be easily converted into one suitable for surveying. In the Legros instrument, the camera is mounted on a circular graduated disc furnished with levels and screws for adjustment in the plane of the horizon. The lens is capable of vertical and horizontal motion on graduated scales; the ground glass, which is a special feature of the camera, is very accurately divided by hair-lines into a great number of small squares. The whole apparatus is mounted upon a tripod, and can be easily transported.

The advance made in photography during the last two years justifies the expectation that the time is not distant when it will be officially recognized in all government and private surveys.

Telephotography is the art of photographing distant objects with clearness and with dimensions greater than those presented to the ordinary vision. It is essentially useful for military purposes, as for instance, in the operations of a siege and for reconnoitring. It may be used as a telemeter and to record the flashes of heliographic signals; it is also of use in surveys.



A
PORTRAIT
STUDY
BY
J.
CRAIG
ANNAN.

Like photogrammetry, long distance photography is not a recent growth, for as long ago as 1854 English astronomers succeeded in photographing the stars. Its application to common affairs was retarded for years by the difficulty of getting a telescope, analagous to those in the observatories, that would be suitable for field work, and also the trouble in overcoming the non-coincidence of the chemical and optical foci. The discovery of orthochromatism, largely due to the experiments of Dr. Vogel, did much to solve the problem of telephotography. By the use of orthochromatic plates and the interposition of a yellow screen, the coincidence of the two foci was established; the disadvantage of this method, however, is the increased length of exposure, which, according to a French authority, is, for orthochromatic plates without screen, two or three times that for ordinary plates, and for orthochromatic plates and yellow screen, the exposure is thirty or forty times greater. For telephotography in balloon work, where instantaneity is required, the coincidence of the two foci is obtained by a specially constructed telescope, the objective and eye-piece of which are each composed of three lenses which permit three kinds of rays to meet in the same focal length. The field is small but the objects are sharply defined. An apparatus of this kind has been successfully used at Grenoble; the shutter works at 1/20 seconds, and the telescope covers a plate 9 cm. by 12 cm. The camera is 25 cm. in length and is fitted with two peep-holes for sighting.

In an interesting lecture delivered last winter by Lieut. Colonel Allotte de la Füye to the officers of the garrison at Grenoble, the subject of telephotography was discussed at length. His lecture has been published in the *Revue du Cercle Militaire* for January and February, 1895.

Colonel Allotte divided all telephotographic apparatus into two classes—simple and compound.

The simple instruments are used for photographing objects at distances less than 9 or 10 kilometres. In this class of instruments the objective has a long focus, the definition is sharp, and the field reduced to a minimum.

The second class are used for photographing very distant

objects. The telescope first used in photographing stars differs from ordinary telescopes only in slight displacement of the eye-piece. As 2 metres appeared to be the maximum focal length of instruments convenient for field work, a demand was created for a telescope similar to those used in observatories, that could be used for photographing terrestial objects, and at the same time be easily manipulated and transported. Attempts were made in this direction by Lacombe and Mathieu, and in 1887 Commandant Fribourg wrote an official report on the subject. A little later Guillemont and Jarret in France, Dallmeyer in England, and Miethe in Germany, succeeded in constructing satisfactory telephotographic apparatus. More recently new types have been placed on the market by Hondaide and Derogy.

The compound or long distance instruments are similar to telescopes used for celestial observations, inasmuch as they have adjustable eye-pieces that may be either divergent or convergent.

The rapidity of all these instruments depends, of course, upon the relation of the opening of the diaphragm to the focal length of the objective. Referring to its rapidity it is customary to speak of the objective as diaphragmed to 1/10, 1/20, 1/30, etc. An objective diaphragmed to 1/30 is sufficiently rapid for use in balloons. For a focal length of 1 metre this corresponds to an actual opening of the diaphragm of $0.^{m}033$, and for 2 metres focal length to an opening of $0.^{m}066$ in diameter. The larger the opening the less satisfactory are instantaneous views, and for this reason it is very difficult to obtain views of objects when greatly magnified.

Excellent results have been obtained by the French officers at Grenoble in long-distance photography. With a camera 21 cm. by 27 cm., and focal length of objective of 1 metre diaphragm to 1/20, instantaneous views were obtained, 13 cm. by 18 cm. The same instrument diaphragmed to 1/60 covered the whole plate, 21 cm. by 27 cm. Pictures were made of forts, barracks, etc., at distances varying from $2\frac{1}{2}$ kilometres to 17 kilometres. This apparatus (21 cm. by 27 cm.) weighs complete 27 kilogrammes, and

may be packed in several packages for ease of transportation. This instrument is specially adapted for photographing the operations for sieges, giving at 5 or 6 kilometres definition sufficiently clear for the plans of a fort, and even the number of guns in the embrasures. When fitted with the long-distance glass it will photograph, at the same distance; the effect of gun fire on the works.

Another telephotograph described by Col. Allotte is much smaller, and consists of the ordinary "lunette d'etat-Major" manufactured by Arizard, of Paris, fitted to a camera. Orthochromatic plates and a yellow screen are used with this instrument. Satisfactory pictures have been made with it at a distance varying from $2\frac{1}{2}$ to 5 kilometres. The apparatus weighs only 8 kilogrammes.

Successful experiments were also made at Grenoble in making what may be called "plunging views" of distant objects. The long distance apparatus is hoisted to the truck of a mast about 120 feet high. It is fitted with rope guys to give it direction, and electrical or pneumatic devices for operating the shutter. A refracting mirror, upon which is marked a line of sight through the centre, is fixed to the camera in such a way that when the objective is directed upon the object to be photographed the object appears at the same time in the mirror; an observer at the foot of the mast notes the reflection in the mirror with a pair of field glasses, and operates the shutter at the proper time. For photographing objects at short distance, a short focus objective is used; for the contrary objects at great distances require a long focus object glass. With this apparatus and an objective of 1 metre focal length, pictures of men were obtained at a distance of nearly one mile. The value of such an observatory in time of war, when smokeless powders are adopted, is apparent; the position of the enemy and the disposition of his forces will be revealed with unerring accuracy.

For use as a telemeter the telescope must be provided with a micrometer, and the number of divisions corresponding to an object of known height at a given distance must be known. Knowing the scale of graduation and the height of the observed object, the distance will be easily found.

When the instrument is used to register signal flashes, a clock-work attachment actuates a sensitized band, which is made to pass through the focus of the objective. The short signals are registered as dots, the long flashes as dashes.

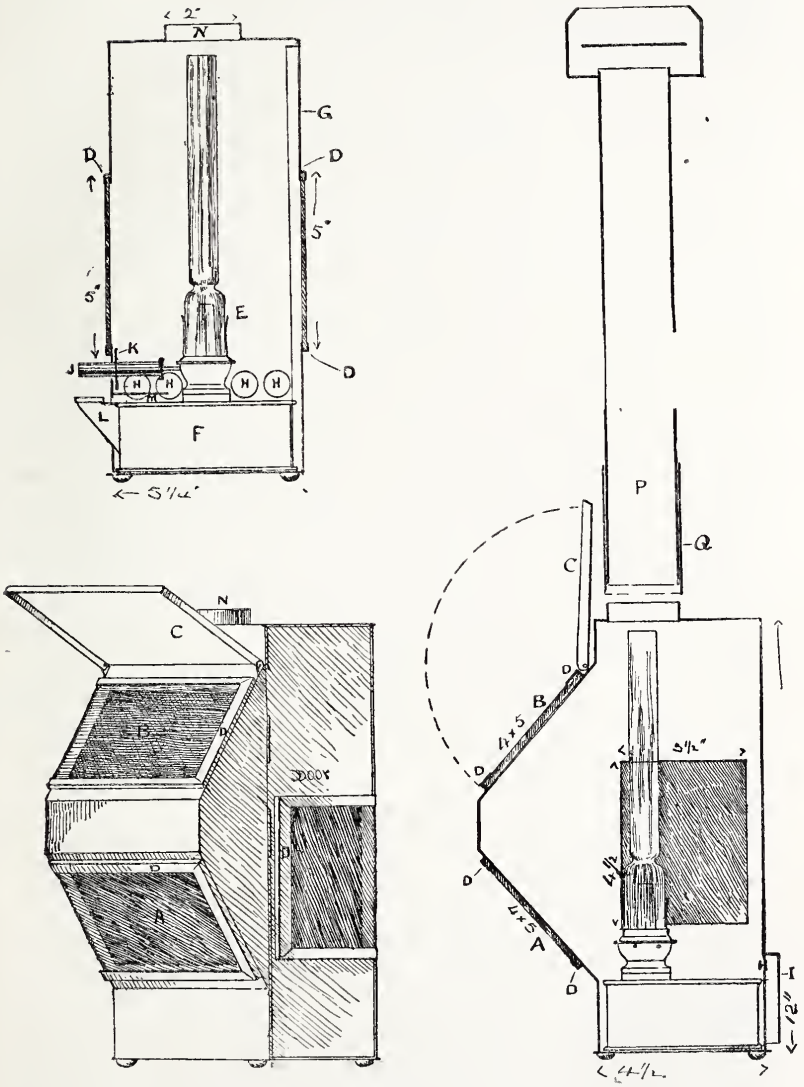
It is to be hoped that our own government will lend its aid to the investigation and development of these two subjects, which, when their promise is fully realized, will prove of inestimable value to the Army and Navy both in peace and war.

## MY LANTERN.

BY R. D. O. SMITH.

VARIOUS dark-room lanterns, costly and cheap, are offered to the amateur by the trade. I have studied them with considerable care, and have tried several of them, but have not found one which meets my desires; so, as has often happened before, I concluded to make one. Very likely it will not please some others so well as it does me; but, nevertheless, it *may* meet the view of some, and it may also serve another purpose, *i.e.*, to encourage that self-helpfulness which is more useful than many blessings. When others fail, our own hands are generally sufficient for our rescue if we have trained them aright. Of course it is not expected that one's own hands can or will always execute the work. I did not with my own hands cut the tin and solder the joints of my lantern, but I showed a tin working friend how I wanted it and he did the rest. In this case I *could* have done it myself, but preferred the other way. It is a great thing to be a tinker, and it is also a good thing not to be over-fastidious. Very rude appliances will produce good results, if you choose to think so, though I do not blame any one who is able and prefers to have everything in first-class style.

I think the vice of the lanterns in the market is in trying too much. Smoke and soot in the ventilating cap, which is made too compact and too tortuous, has been my trouble. One point aimed at has been compactness and cheapness. A no-chimney burner is generally employed, for no reason that I know of, except accessibility with the light-




FIGS. 1, 2, 3, ILLUSTRATING "MY LANTERN."

ing match. To gain this small advantage, we encounter smoke which stops the top outlet, and a troublesome, greasy deposit which obscures the glass.

If I were blessed with a backbone like a snake or with Japanese legs, I would not object to the side twist or to the squat needed to examine my negative by a side or front light. I have neither the backbone nor the legs, and I want to look at my negative while standing comfortably upright.

Therefore, I made my lantern with a chimney burner and a straightaway pipe to carry off heat and products of combustion. I made it with four glasses: two in front and one at each side to illuminate the space at right and left hand of the lantern. At my right hand is a little shelf for the graduate containing my developer. At the left hand is my hypo tray—both are in plain sight. The front glass, *a*, projects and overhangs the developing tray; the other, *b*, recedes and permits me to look down at the lamp flame. This latter I depolished by grinding it with a little emery flour and water, using a fragment of glass with a little block of wood glued to it for a grinder. It required only a few minutes to do it. All these glasses are 4 x 5 inches. I adopted that size because I happened to have two pieces of ruby glass 5 x 8 inches and I cut them in two. I think the size is about right. The depolished glass gives a beautiful uniformly luminous ruby surface by which to examine the stage of development. As it is not desirable to have the glare of this surface in the eyes, I cover it with a hinged cover, *c*, which is turned up when desired.

The opening in the tin must be half an inch smaller than the glass, and the glass is held in by over-lapping strips, *d*, soldered to the lantern body so as to form grooves into which the glass slips. Being right-handed, I prefer to place these so that the front glasses will slip in from the left side. The side glasses may slip in from the back. Any leakage of white light will then go away from the plate under treatment. I stop any leakage, however, by calking the joint with a little strip of black cotton velvet, of which I always have a piece handy, for use about front boards or other places which ought to be light-tight.

The lamp I selected is a number one argand, or round hollow wick burner, *e*. I suppose any other small burner would do, but the cone of the argand is glass, and the light may be reduced to the smallest point without being lost. From the top of the oil pot, *f*, to the top of the chimney is 9½ inches. A small flat wick burner would not be so high. My oil pot is about 2 inches deep, so that the whole height of the lantern is 12 inches. One side is provided with a door, *g*, the whole height, through which, when opened, the lamp pot with chimney on may be drawn for lighting. This door I hinge along the front edge because the hinge affords better assurance of a close joint. The door is also provided with wide closing-in flanges to stop the exit of light, and is provided with a spring latch which closes over the corner of the lantern. At the back is a series of half-inch holes, *h*, covered with a shield, *i*, behind, for ample ventilation.

It is of importance to be able to control the wick and also to refill the oil pot without opening the lantern. I therefore solder to the button of the wick raiser a piece of tube, *j*, long enough to extend through the side of the lantern, opposite the door, and large enough to enable the fingers to manipulate it. This tube, therefore, comfortably fills the hole in the lantern side, but escape of light may be effectively prevented by a flange, *k*, soldered to said tube. A projecting filler, *l*, may also extend through the side of the lantern.

When the lamp is slid through the door into place in the lantern, the wick-raiser and filler pass through their appropriate apertures, and, if it is necessary, an inwardly projecting plate may be soldered to the lantern body to project over the top of the oil pot far enough to prevent the escape of light through the aperture around the filler.

The chimney stands directly under the outlet, *n*, in the lantern top, and a flange is placed around said outlet. The ventilating pipe, *p*, is of sheet iron 2 inches in diameter and about 3 feet long. In my dark-room it is fastened to the front of some shelves, and was made 3 feet long so as to extend above the upper shelf. It is placed permanently, and its bottom is provided with a sliding sleeve, *q*, which may be pulled down to close over the flange on the lantern top.

An intelligent tinner will make one of these lanterns, oil pot and all, in three hours, and the owner can ornament it with paint and gilding if he wants to, or let it go unpainted as mine is, if he prefers.

## PHOTOGRAPHIC STANDARDS.

BY CHAPMAN JONES.

THERE has been a considerable outcry made lately in favor of standards of various kinds in connection with photography, and, as is usual in such cases, some have drowned their power of discrimination in their unrestrained enthusiasm. They would give us not only standard apparatus but standard processes, and it appears logical to suppose that they would if they could take the final step and standardize photographers themselves.

In some things uniformity is desirable, and leads to nothing but convenience and economy, while in other cases it is a direct barrier to progress. It is not always easy to determine whether a standard would be on the whole beneficial, or granting that it would be good whether its establishment would prove profitable, but as an example of an undesirable standard, it may be stated that it has been seriously proposed to have a standard developer. Now it is obvious that the developer must be such that it will give the required result with a given exposure on a given plate. If the developer is to be uniform then the plate and the exposure must be made to suit it, but if any developer is available then plate-makers are free, if they can do so, to effect improvements in their plates, that can only be taken advantage of by the employment of an exceptional or novel method of development. To establish a standard developer would be to depreciate progress in plate-making.

As an example of standards that would be good, but the establishment of which would probably be unprofitable, we may refer to suggestions that have been made now and again

to alter the sizes of sensitive plates in order to gain in uniformity of proportion. Now, if there were no cameras nor plate-making apparatus in existence, and sizes had to be devised, probably no one would dream of suggesting our present sizes. But the case is vastly different. There are tens of thousands of cameras and other apparatus suitable for the sizes of plates at present used, and the question is whether it would be worth while to incur the cost of change for the benefit that would result. As inner frames can easily be obtained of any size, and as plates can be cut to any dimensions, I certainly think that a new set of standard sizes would lead to cost and inconvenience which would be altogether out of proportion to any little advantage that might be secured.

On the other hand, the adoption of lens-screws of uniform sizes of patterns would be of much convenience to photographers, and present absolutely no drawbacks. It would necessitate a certain expenditure by some opticians, but this would not be great, and the gain would certainly be well worth what it would cost. This, therefore, is a matter that all photographers may very well do their utmost to promote, but if the best success is to attend their efforts they must work together. The Royal Photographic Society of Great Britain proposed standard screws fifteen years ago which have met with much favor, and have been adopted by many opticians. To propose any other screws as standards at the present time is to actively endeavor to promote diversity in this matter. Those who do this do not occupy neutral ground, but are directly antagonistic to the principles they profess.

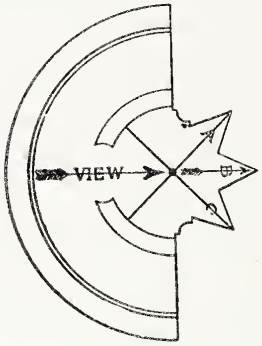
The three cases we have considered may be regarded as typical of, probably, all standards that have been proposed. It would be well if those who have any voice or power in this matter would consider more carefully than appears to be usual, when it is proposed to establish a standard for any apparatus or process, 1st, whether a standard is desirable, or whether it would not do more harm than good; 2d, if desirable, whether it would be worth the cost of establishing it, and if so, 3d, how far any existing standard may have been already adopted.

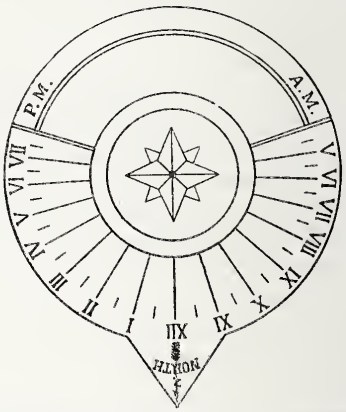
## A PHOTOGRAPHIC COMPASS.

BY C. W. CANFIELD.

THE little contrivance figured herewith will not occupy much space in the photographer's outfit, and he may find it of real service when prospecting in an unfamiliar region. It is not original with me, as I got the hint from a French source.

The diagrams herewith are to be copied or pasted on thin ncardboard, and the outlines cut out. The half-circle is the




mounted upon the face of the other by means of a pivot passing through the common centres, leaving them movable separately.

The hour being known to you, turn the point *B* so that it indicates this hour on the lower dial. Now place a match, or similar object, vertically over the centre pivot, and turn the whole affair until the shadow cast by the match passes through the point *B* and the indicated hour. By this manipulation the point *N* will now indicate north.

Without changing the position of this point, turn the upper card until the point *B* is directed toward the centre of the view or object to be photographed. The hour then indicated by *B* is the hour of the day when the subject will be normally lighted, that is, by full sunlight, directly in

front. *A* and *C* then indicate the hours of morning or evening, when the light reaches the subject at an angle of 45 deg. from one or the other side, a lighting which is generally preferable.

Provided with this device one can make a photographic reconnoissance and lay out a day's work in advance, with the confidence of securing the wished-for results.

## HOW TO TIME A SHUTTER.

BY JAMES E. BOYD.

WHOEVER is accustomed to use a shutter is aware of the importance of knowing approximately the time of exposure afforded by it. The figures given by the makers are not always sufficiently exact, and a spring may be bent accidentally or become weakened by use, thus changing the speed of the shutter which it operates. So the photographer feels the need of some definite knowledge of the instrument which he uses, but is deterred from attempting the measurement for himself by the supposed difficulties of the experiment. Most experiments are difficult, until we have performed them once or twice, and become easy as they become familiar. It is the purpose of this paper to give some directions for timing shutters by simple methods.

The most common way is by means of a ball falling in the sunlight near a graduated scale. Snapping the shutter when the ball has nearly reached the ground, we get a picture of the scale and a bright streak due to the reflection of the sun from the surface of the ball. The length of this streak depends upon the velocity of the ball and the time of exposure. For instance, if a ball moves in front of a shutter with a velocity of 40 feet per second and the time of exposure is one one-hundreth of a second, the streak on the plate will be equal in length to four-tenths of a foot of a scale whose distance from the camera lens was equal to that of the ball. In the case of freely falling bodies the velocity is, of course, not

quite uniform, but the time may easily be determined by the well-known formula:

$$s = \frac{gt^2}{2} \qquad t = \sqrt{\frac{s}{\frac{g}{2}}} = \sqrt{\frac{\text{distance}}{16.1}}$$

That is, the time, in seconds, required for a body to fall any distance is equal to the square root of the quotient of the distance (expressed in feet) divided by 16.1.

The scale serves the double purpose of indicating the total distance of fall and the space traversed during the exposure. It should extend to the starting point, or at least the distance of that point from some line of the scale should be known. As an example: suppose the middle of the ball be placed on a level with the top of the scale and, on the negative, the beginning of the streak is opposite 10.2 feet, while the length of the streak is .24 inch and 2 feet on the scale is equal to 2½ inches on the negative. The distance traversed during exposure is then

$$\frac{.24 \times 2}{2\frac{1}{2}} = .192 \text{ feet.}$$

$$10.2 \div 16.1 = .6335. \quad \sqrt{.6335} = .796 \text{ seconds,}$$

the time required to fall 10.2 feet.

Also

$$10.2 + .192 = 10.392. \quad 10.392 \div 16.1 = 6455. \quad \sqrt{.6455} = .803 \text{ seconds,}$$

the time required to fall 10.392 feet.

$$.803 - .796 = .007 \text{ second,}$$

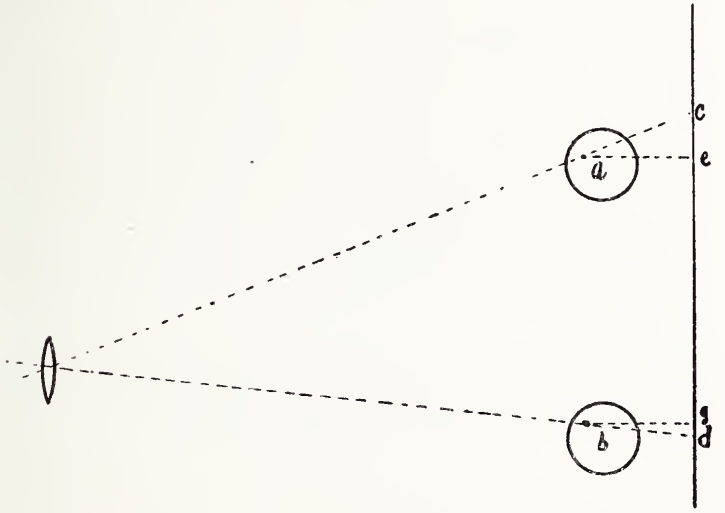
which is the time of exposure.

The ball used in this experiment should be an inch, or more, in diameter. If it be too small, the streak will be narrow and faint at the ends, so that it will be difficult to determine its length. On the other hand, if the streak be wide, its width should be subtracted from its length to get correct results.

The ball should be of some dense material, so that at ordinary velocities the resistance of the air may be neglected, and it should, of course, have a good reflecting surface.

Steel, tin, and brass amalgamated with mercury or silver plated, are satisfactory.

It is generally the custom to have the ball drop in front of the scale. This has the advantage of convenience of comparison. On the other hand, the scale makes a poor background, unless a special one be made having fine white lines on a black field. Moreover, this arrangement puts ball and scale at unequal distance from the lens. This makes a correction necessary, the apparent length of the streak being multiplied by the ratio of the distance of ball and scale from




the lens. This is shown diagrammatically in the figure, where *a b* are the positions of ball at beginning and end of the exposure, *c d* the apparent length of the streak and *e g* its true length. It will be observed that I use a point half way between centre and front surface, this being approximately the position of the sun's image.

A better plan is to drop the ball a little to one side, so as to bring this image of the sun in the plane of the scale. An ordinary tape-line or yard-stick may then be used. A piece of black cloth should be hung up for a background. If this be large enough to cover the entire field of the lens, several exposures may be made upon one plate.

This experiment affords fine practice in the use of a shutter. Suppose the field of your lens is a only 4 feet in diameter and the ball has a velocity acquired by a fall of 10 feet. You have then about one-fifth of a second in which to snap your shutter.

If you watch the ten-foot mark at the top of the field, and endeavor to make the exposure while the ball is falling the next four feet, you will probably be too late. If you follow it with your eye from the start, you are liable to snap the shutter too soon. A better plan is to watch some point a foot or two above your field.

An automatic arrangement for snapping a shutter is easily constructed. Where air is used, place a valve between bulb and shutter. Let this be held open by a spiral spring. Place a light piece of a board or a stiff card horizontal so as to engage an arm extending from the valve and hold it shut. Arrange this so that a slight downward pressure on the board will release the arm and allow the spring to open the valve. If now a steady pressure be applied to the bulb, there is a rush of air through, the instant the valve opens, which snaps the shutter.

To use this apparatus, place it to one side and a little above your field, and drop two balls, at the same time, one to strike the horizontal board and the other side your scale. If there is no leakage, pressure may be applied to the bulb by means of a weight, thus allowing an observer to work without assistance.

A convenient arrangement for dropping the ball, is to bore a hole of somewhat smaller diameter into a block of wood, and hold the ball up against this.

A second method, easier to operate and calculate, is by means of a shaft, revolving at a known rate, to which is attached some bright body having a spherical surface. An engine or motor shaft, or a speed lathe will do. A hemispherical disk of tin is a good bright object. If this be illuminated throughout its entire path it gives a bright ring, approximately circular. If an exposure be made, we get an arc, whose length is to the circumference of the complete circle as the time of the shutter is to the time of one revolu-

tion. Where a graduated circle can be arranged concentric with the shaft, the angular length of the arc may be obtained. For example, the shaft is making 1500 revolutions per minute and the length of the arc is 65 degrees. The time of one revolution is .04 sec., and $\frac{65}{360}$ of .04 = .0082 sec., the time of exposure. Where this arrangement is not convenient, make two exposures with the camera in a given position, one of which is a time exposure, giving the complete circle. Print and mount the results, then trim down to the circles and measure the lengths with a line.

If the sunlight be not parallel with the shaft, the circles will be slightly eccentric, since the image of the sun will always be in one direction from the centre of the reflecting surface. It can readily be seen that this introduces no error when the calculation is made by the second method given, and only a slight one when a graduated circle is placed concentric with the shaft.

Knowing the angle of the incident light and the radius of curvature of the reflecting surface, the eccentricity may be easily determined and the graduated circle adjusted accordingly; or the adjustment may be made by direct comparison with the circle of light. If you have a large plane mirror, with an aperture at the centre, the camera may be placed behind this, and the light reflected parallel to the shaft, so as to get rid of the eccentricity entirely.

## NEGATIVES, AND NEGATIVES.

BY E. F. PHILLIPS.

$\square = 3\frac{1}{4} \times 4\frac{1}{4}$. $\bigcirc = 4\frac{1}{4} \times 6\frac{1}{2}$. $\square = 4 \times 5$. $\square = 6\frac{1}{2} \times 8\frac{1}{2}$.

$\square = 8 \times 10$. $\square = 11 \times 14$. $\square = 14 \times 17$.

NEGATIVES, and negatives. Whew! what lots of them, and how wonderful it is that so many of them are fit to print from, just set back on an open shelf, and some of them, like grandfather's clock, too large for a shelf, and stood on the floor, with no protection from feet or dust.

So thought Mr. H. Withers, who had just taken possession of an old gallery he had purchased in a Western city. He had been obliged to pay about twice too much for the outfit, but the stand was a good one,—in one sense of the word. It was on a corner of two principal streets, and the reception room could be reached by a stairway from either, but the sitters needed a pilot to get from the reception room to the operating room. They had to go along a short hall, up a long flight of stairs, and clear to the end of a long right angled passage.

What to do with the accumulated negatives, he hardly knew. He feared all the old plate boxes had been destroyed, and to buy negative preservers for all the unprotected negatives would add considerably to his already heavy outlay.

He was greatly pleased when, a little later, on some shelves, up in the top of the dark-room, he found a lot of plate boxes, nearly enough to store them all.

Fortunately his predecessor had numbered all the negatives from which he had received orders, so from the order book an alphabetical index could be made, and, when he had arranged the negatives in numerical order, he put them away, twelve or more in each of the old plate boxes, and printed in large, bold figures, on the blank end of the cover of each, the numbers of the undermost and uppermost negatives.

I was very much surprised when I visited the gallery a few days after he had taken charge. It looked so strange to see no negatives standing round that I asked him what he had done with them. He pointed with pride to the stacks of boxes. "The triple boxes," he said, "are the best, as the inner ones can be set into each other, and so make a doubly strong box to hold the negatives."

It was such a good plan that I went home and did likewise, except the improvement, in indexing, of using the characters at the commencement of this article, to designate sizes, so there is never any time lost looking in the wrong size box for a negative.



Photochrome Engraving Co., N. Y.

"A RISE IN THE WORLD."

By THE MARQUIS DE ALFARRAS.

# PHOTOGRAPHING VOCAL CORDS IN ACTION.

BY PROF. WILLIAM HALLOCK
(*Columbia College*).

DR. FLOYD S. MUCKEY has discovered that some favored few, in singing, are able to get the high notes, not by simply stretching the cords tighter, but by rotating the aretynoid cartilages they can also shorten the effective length of the cords. In order to prove



FIG. 1.

this a photograph of the cords must be taken while the person is singing. Not everybody can sing with a mirror in the back of the throat, but fortunately Dr. Muckey can.

Fig. 1 shows the general disposition of the apparatus. The victim sits with his chin in a ring stand, to insure steadiness and focus. The left hand holds the laryngial mirror



FIG. 2.

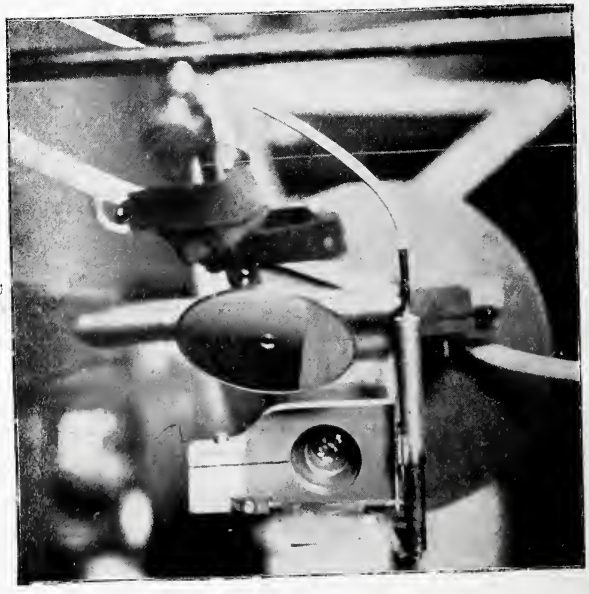
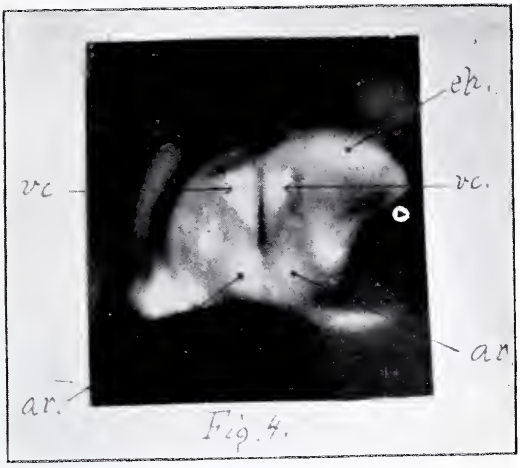


FIG. 3.




Base C. *a r.* The Aretynoid Cartilages.
*v c.* The Vocal Cords. *e p.* The Epiglottis.

in the throat; the right hand controls the bulb of the pneumatic shutter. By means of a large concave mirror a beam of sunlight is thrown into the mouth upon the small mirror and thence down the throat. The camera is so mounted that it points into the mouth and sees the cords in the laryngial




V p. The Vocal Processes.

mirror. Upon the front of the shutter door a small mirror is so mounted that the operator can see down his own throat just what the camera sees when the shutter is open.

(See Figs. 1, 2 and 3.) The camera shown has a rotating back so that four 2 x 2½ pictures can be successively taken upon a 4 x 5 plate. When all is ready the plate-holder is inserted and the slide withdrawn; the subject holds the laryngial mirror so that he sees just what he wishes to photograph, sings, and squeezes the bulb; relaxing the bulb closes the shutter. The accompanying photographs require no special explanation to show how the cords are shortened for the high notes. (See Figs. 4, 5 and 6.) Fig. 7 is a print

LOW NOTE. HIGH NOTE.



HIGH NOTE. FIG. 7. LOW NOTE.

from a negative showing the four exposures on one plate, by means of the rotating back of the camera. The lens used is a 4 x 5 Lavern with the next to the smallest stop, and about a four seconds' exposure upon a Seed plate. In order to lengthen the effective focus of the lens and enable us to obtain natural size photographs, I inserted a ten cent negative spectacle lens of 4 inches focus, 6 inches behind the principal lens.



American Photo Engraving Co.

"NO CREDIT GIVEN."
BY J. CHESTER JERVIS.

I hope to photograph my own vocal cords as soon as I can hold a mirror 1¼ inches in diameter in the back of my throat without feeling as if I were at sea.

Of course vocal cords have been photographed before, but we have found the above arrangement of mirrors and shutter particularly convenient and effective.

## MEASURING THE VELOCITY OF THE "PEACE MAKER'S" PROJECTILE.

BY C. FRANCIS JENKINS
(*Engineer*).

THE science of exact measurements has been reduced to such precision that no one is surprised any more when really remarkable data are presented, so used to erstwhile startling phenomena has the public become. In no branch of this work has more advance been made than in that of determining the flight of a shell fired from modern ordnance. This is as easily done as measuring a carpet with a yard stick, and with infinitely more accuracy. In the con-



THE PEACEMAKER. BY C. F. JENKINS.

struction of this new "yard stick," however, photography largely enters. In fact, the instrument embodies several newly discovered principles, among which the action of an electric current on light passing through Nicol prisms stands out prominently. It is a well-known fact that light passes uninterruptedly through Nicol prisms if their axes are parallel; however, if one of the prisms is placed at right angles to the other, light will pass only through the first. The action of these prisms, is, of course, to polarize the light, the planes of vibration of which now conflict. If, however, these prisms are brought into a magnetic field, and this field is disturbed in any way, the polarization is reversed, allowing the light to pass for the briefest interval after each disturbance. This, and the fact that a tuning-fork vibrates at exactly the same rate through its whole time of vibration, though with gradually decreasing amplitude, when taken in connection with the sensitive photographic plate, is the foundation of the instrument, which, outwardly, much resembles an ordinary camera.

In the back of the box a very sensitive negative is adapted to be rapidly rotated. There are two lenses, the lower one of which is fitted with a time shutter arranged to be opened and closed electrically. In front of the upper lens, in a strong magnetic field, are placed two Nicol prisms, with their axes at right angles to each other. For attacking the plate an arc light is so hung that the crater of the positive carbon is directly in line with the axis of the prisms and the primary lens. The light from the same arc is projected in a tiny ray through a pinhole in a small disc fastened to one prong of a tuning-fork, having a magnetic vibrator for keeping it in motion when once started. These are the essential elements of the instrument itself. Now, at the muzzle of the gun two terminals are so located that the passing shell shall complete the circuit through the shutter mechanism and the prism field. A screen is set up a given distance from the gun in the line of fire, and is a part of another circuit which the shell breaks by passing through it.

Considering now that all is in readiness, the current is turned on through the lamp; the motor which revolves the

plate is started; the fork vibrator is put in circuit, and the gunner stands by awaiting the order from the commandant to fire. Immediately this is given the firing pin is pressed and the projectile, as it leaves the muzzle of the rifle, completes the circuit which opens the shutter of the camera, and the vibrations of the tuning-fork begin to record upon the plate

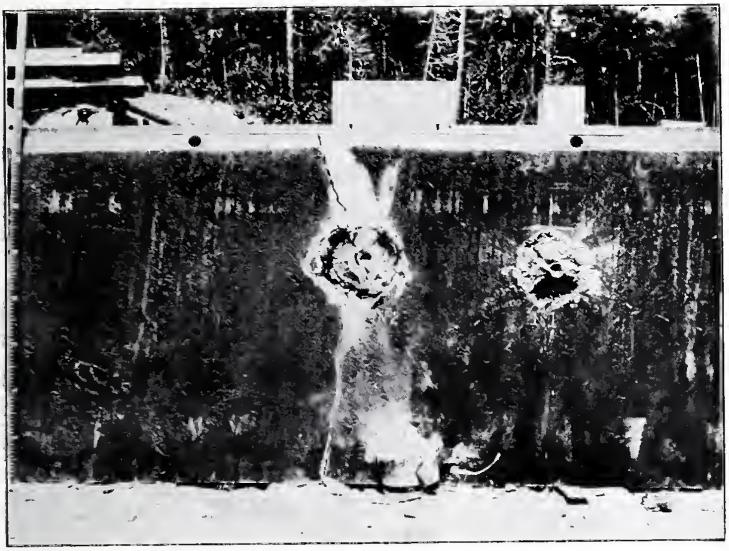



By C. F. Jenkins.

RRCORD OF A CARPENTER SHELL FIRED FROM A 13 IN. BREECHLOADING RIFLE.

in a little jagged line. The light from the arc through the primary lens would not get through, of course, owing to the interference of the prisms, were it not for the fact that the circuit which opened the shutter closed the secondary circuit through the field of the prisms. The action of the current on the prisms, or more properly, on the light itself, causes a ray to be admitted into the camera, through the primary lens, for the briefest interval. The passing of the shell through the screen, say, one hundred feet farther on, interrupts the electrical circuit, which again disturbs the prism's magnetic field admitting another flash of light into the camera and also closing the shutter of the secondary lens.

To follow the shell farther is not within the scope of this



By C. F. Jenkins.

SECONDARY BALLISTIC TEST OF 18 IN. HARVEYIZED ARMOR PLATE. STRIKING VELOCITY 1926 FOOT-SECONDS, EVERY 21.882 FOOT-TONS.

article, so an examination of the plate follows, which, at first glance, presents a rather disappointing appearance as a product of all this combination of science and mechanics, having upon its surface only a little jagged line, the arc of a circle, and two little spots. However, this is enough to tell a very interesting and valuable story, for, knowing the number of vibrations of the tuning-fork used and the distance between the two screens, or the screen and the muzzle of the rifle, by counting the number of recorded vibrations between the spots, it is an easy matter to accurately calculate the flight of the shell, as the development of the plate, the shrinking of the emulsion, etc., does not in the least affect the accuracy of the record because the record-line and the spots of light are in such close proximity.

There is a peculiarity about the spots which has not, so far as the writer is aware, been satisfactorily explained. The light is admitted through a square hole. This should make a square spot on the plate. It does not, however; and various theories have been advanced to account for this, none

of which seems, so far, to be satisfactory. For instance, it is observed that at one time the spot will be elongated at an upper corner, at another time in a lower corner, and yet again in the middle. The front edge, or the edge in the direction toward which the plate is moving, is always straight and sharply cut. It may be just possible that the prisms hold back the light slightly, or that the magnetic field, or rather its effect on the light, is not readjusted instantaneously.

By the use of this instrument the moment of impact of the shell upon the plate can be accurately determined, and also the proper length of chamber in which the slow-burning powder used shall be most effective. But, probably, the most remarkable fact which this combination of electrical and photographic science has brought to light, is that the projectile, after leaving the gun, continues to increase its velocity for several feet beyond the muzzle, as though the rifle were longer than it really is by just so many feet.

The test of this gun has been conducted with a great deal of interest for many reasons, but the fact that it bears the name it does is probably one of the most fruitful reasons therefor. Many were the ominous remarks aboard the boat which carried this rifle to the proving-grounds, dismantled, and many more will follow when it is brought up the river all fitted and mounted for action. The cause of the troubled hearts is the fact that the former "Peacemaker" was such a disastrous piece of ordnance under similar conditions in 1841. And any old tar of the navy will tell you, if you ask him, of the awful scenes following the bursting of the gun and the consequent slaughter on board the "Princeton," which included in its victims the Secretary of State, the Secretary of the Navy, and other prominent officials of the Government and their ladies. And as he sits on the gunwale and says, in more than half a whisper, while passing the fort, "this is the place," one feels an involuntary chill of the cuticle, and drops the voice in sympathy with the silent, almost sullen aspect of the river, with so many secrets of awful calamity locked up in its dark bosom.




T. Elliot, Engraver.

HELENE HELMICK.

BY WM. MORRISON.



"SHE'S WAITING." BY J. POUNDSTONE.

## A FEW PRACTICAL HINTS.

BY EMIL DE NEUF.

### To Dry Unmounted Prints.

FIRST lay out the prints, face down, on a blotter, then cover them with another blotter; roll them down, taking off all surface moisture; now lay them out again, face down, on a dry blotter, and they will dry quickly, without curling or particles of the blotter adhering to them.

### Washing Small Lots of Prints.

Instead of the syphon box generally used for the washing of prints, I have been using, when a small batch of prints was to be washed, a shallow porcelain tray, several sizes larger than the prints. Put prints in face down, and incline the tray, raising one end a little higher than the depth of tray, and let a steady stream of water run into the higher

end of tray. Every few minutes pour off the water, and firmly press prints down, removing all water between them. Then set under tap again, and move prints around. In this manner prints will wash thoroughly in a very short time.

### Mounting Prints.

For the rubbing down of prints with the mounts I have used, instead of the rubber rolls or squeegee, a piece of wood, about a foot long, three inches wide and a half-inch thick. The edges of this were rounded off, and were used for rubbing over prints.

I lay my prints out on a blotter, which has been folded in half; the one half being used for the bed, the other for the cover or rubbing pad. This arrangement prevents all possibility of the latter ever slipping and disarranging the print on the mount. I have found that with the above described rubbing contrivance the prints will adhere quicker and more evenly than when the roller was used.



CALM EVENTIDE. BY MISS F. B. JOHNSTON.

## LANTERN-SLIDE MAT TRIMMER.

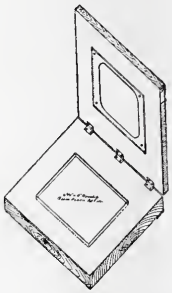
BY W. N. JENNINGS.



J. G. W. Wundram.

THE annexed sketch will make clear, I think, a handy form of lantern-slide mat trimmer, which has saved the writer so much time and trouble during the last three or four years, that it gives him pleasure to pass the "wrinkle" along the line.

In the centre of a piece of well-seasoned wood is cut a recess, 3¼ x 4 inches, deep enough to receive a piece of plate glass of the same size, set in a little *lower* than the surrounding surface.



Hinged to this baseboard is a lid, having a hole cut in the centre, 3 x 3¾ inches on the under side, and beveling outward to 3¼ x 4 inches. To the inner side of the lid is attached, by means of four screws, a thin steel "form," projecting *above* the surrounding surface. This form may be removed and another, having a different shaped opening, substituted in a few moments.

An untrimmed lantern-slide mat is placed on the surface of the plate glass. The hinged lid is closed; the projecting steel form presses evenly upon the mat, holding it firmly in place. A "Robinson" trimmer is run around the opening of the "form," and the mat is trimmed in perfect register with others that follow.

## HAND CAMERAS—THEIR USES AND ABUSES.

BY W. FENTON-JONES.



Lucy Baldwin

PERHAPS, reader the question has often come to your mind, "How is it there are so many amateur photographers," but seeing the vast number of hand cameras now in use the question is easily answered. Whether or not hand cameras benefit photography generally is a very open question on account of the very indiscriminate way in which they are used nowadays, for the apparently easy manner of manipulating "draws" the multitude into taking up photography more or less successfully. Hand cameras are all very well in their way, but, after all, generally the success achieved by their use is not of the same stable nature as that obtained by the old form—a stand camera.

Mr. Horsley-Hinton's description perhaps is most pertinent, when he states that "the hand camera is to the photographer what a sketch-book is to the artist." It is fresh within our minds that a very successful worker in London recently remarked, "I always take a stand with me when I have my hand camera out, and always prefer to use it whenever practicable." Of course, then, it is no longer a hand camera.

The great evil to me seems, that, with magazines principally, the great and prevailing idea is: How many plates can we get through in the shortest time, and it becomes a great boast that we have used some many hundreds. Personally, I look on hand cameras of the magazine type as a "trap to catch the unwary." They look so nice and easy to work, and manufacturers vie with each other who shall bring out "the best." Actual practice, however, proves that in

the long run plate holder are better, for what magazine man has not experienced, some time or other, something sticking (always at a most critical time too), plates refusing to drop, getting scratched, dust thereon, and numerous other difficulties? I fear few, and generally have found that with all those who intend to "go on further" with photography and to do really serious work, the older and better form of plate holder becomes adopted. Perhaps there is nothing more abused than the hand camera, generally speaking, for the great majority possess no rising front or swing-back, and the movements generally are very crude and unreliable, aud again some do not possess the necessary focusing arrangements, relying on a fixed focus or a scale, so that the user has to rely on his own, sometimes, uncertain judgment as to distance, and the consequent result is, like his ideas, fuzzy.

How much better is it then for a beginner to go to some friend who has matured in the use of a hand camera, its certainties and uncertainties, etc., for advice, rather than to make for the thing that looks the best in an advertisement.

The advice given would almost sure to be—keep away from hand cameras until you have gained experience with an ordinary camera; but if you are *bound* to hand a "snap shooter" get it with all the movements of an ordinary camera and use plate holders.



THE RACE. BY L. M. McCORMICK.



Copyright, 1895, By R. Eickemeyer, Jr.

Photochrome Engraving Co., N. Y.

"A GRAY DAY IN THE MEADOW."

By R. EICKEMEYER, Jr.

# PHOTOMICROGRAPHIC APPARATUS.

BY DR. A. CLIFFORD MERCER.

IN the fifth edition of Dr. Beale's "How to Work with the Microscope," page 309, is a wood-cut representing my wet-plate apparatus for photomicrography (not micro-photography) as it stood in 1880. The old support, consisting of a camera bed about six feet long with a single leg at one end and a round table-top expansion with three legs at the other, is also the support of my present apparatus. The sliding-box camera has been replaced by a bellows camera taking plates up to 8 in. by 10 in.

Figs. 1 and 2 show the general arrangement of the apparatus on the table-top expansion. The camera front moves

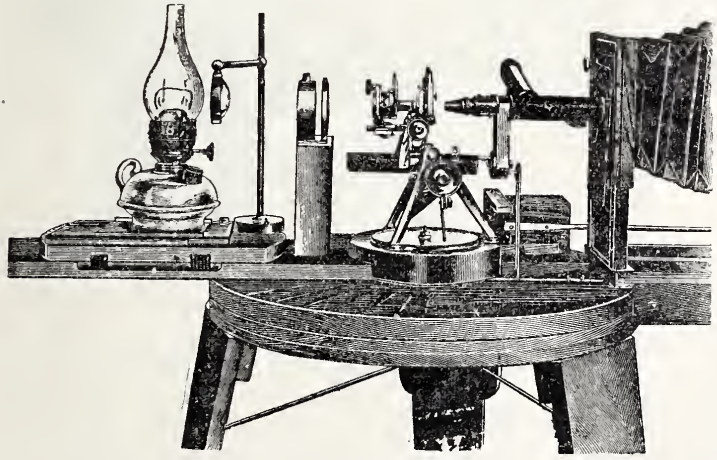


FIGURE 1.

freely toward the microscope, a hole in the front board receiving the eye end of the horizontal microscope tube until the board comes in contact with a black card fitting light-tight about the tube. The camera front is easily removed, so the eye can glance through the microscope without changing the position of the instrument, or, so the microscope and all the apparatus for artificial lighting can

be turned to one side for arrangement and then turned back again. That the latter may be done, the microscope and lighting apparatus stand upon a board which revolves about a vertical axis passing through the object on the stage. I prefer, however, to have the microscope and camera constantly connected and to use a secondary horizontal tube, at a convenient height for the eye when sitting, projecting at an angle of 90 deg. from one side of the ordinary axial tube, as shown in both Figs. 12. and

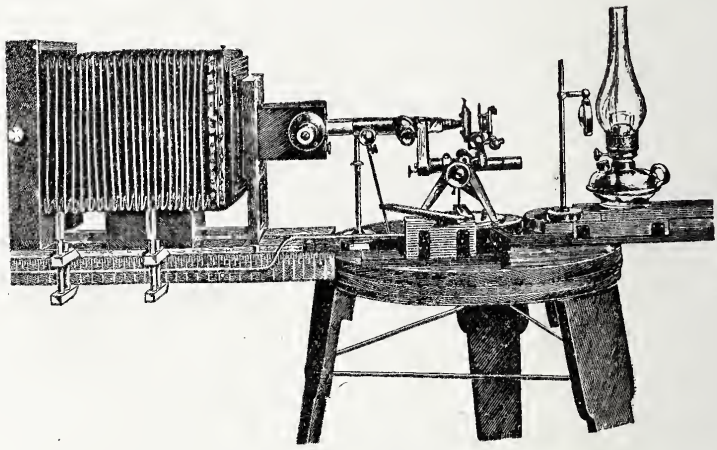


FIGURE 2.

A plane mirror, silvered and polished on its surface toward the objective, and set at an angle of 45 deg., reflects the picture-forming rays from the axial into the side tube. The eye-piece of the side tube is 10 inches (central measurement through the two tubes) from the objective When the position of the object and its illumination are satisfactory, the mirror is withdrawn by a sliding button, Fig. 4, wholly into the side tube, allowing the objective to project the image into the camera. The axial tube in addition to having its inner surface well blackened, contains a sufficient number of diaphragms to thoroughly prevent internal reflection. When an eye-piece is not used in the axial tube, a dummy eye-piece with diaphragms but without lenses is inserted to prevent reflection from the

interior of the eye end of the tube where it is always more or less bright. I have found this dummy eye-piece a matter of importance. The bright surface it should cover has been quite commonly neglected and, therefore, has been the cause of many poor results in photomicrography.

In Fig. 2 is seen a block of heavy wood which slides in a direction parallel with the axis of the microscope, without lateral movement and on cloth bearings, between two cleats of hard word screwed to the table-top expansion. The block is moved back and forth by a brass rod supported all along one side of the camera bed. From the top of the block projects toward the microscope a small bar of wood with a screw-eye at its free end. A lever-rod fastened, by a clamping ring and milled-headed screw, to the coarse-adjustment wheel, drops into the screw-eye. By this simple contrivance coarse focusing can be done on the ground glass at any distance from the microscope—by moving the long brass rod in its support, and so moving the block and lever. From about the fine-adjustment wheel, Fig. 1, an endless cord passes down and about a pulley wheel, actuated by a brass rod supported all along under the camera bed, so that fine focusing can be done at any distance from the microscope. Coarse focusing is done on the ground glass, fine focusing by a focusing lens held against a piece of polished plate-glate substituted for the ground glass.

Projecting from the sliding block is a second bar, ending with a screw-eye which receives a lever from the rack and pinion moving the draw-tube. Either lever is quickly fastened or loosened by a thumb-screw closing or opening the ring about the milled-wheel. First one lever alone, or the other, is used; never the two together. The draw-tube lever is used when by the Woodward method the back focus of an objective is extended by an achromatic meniscus screwed into the objective end of the draw-tube. It seems to be almost forgotten that Dr. Woodward produced his famous photomicrographs by this method. The method, briefly, is first to arrange the object and illumination, to adjust the objective-collar most carefully for thickness of cover-glass and tube-length; then to remove the eye-piece,

to screw the meniscus into the objective end of the draw-tube; and, finally, to adjust the draw-tube until the meniscus is at the right distance from the back of the objective to extend the focus to the ground glass, the objective meantime remaining undisturbed in its best condition. No other method gave as good results until the apochromatic method was introduced. In the apochromatic, however, the objective is not left undisturbed, and the projecting eye-piece has two lenses and four reflecting surfaces. If it were practicable to make a compensating concave with only two reflecting surfaces, analogous to the Woodward meniscus, to be used instead of the projecting eye-piece, a so modified apochromatic method would be more rapid and might give even more brilliant results.

The lamp, edge of flame toward object, and bull's-eye condenser are carefully centred on sliding boards, so as to be able to use conveniently Mr. Nelson's method of illumination. The light passes through the bull's-eye condenser, a cell of water or alum solution and a thinner cell of ammonio-sulphate copper solution, see Fig. 1, both supported on a block of wood between the lamp and the sub-stage condenser, to eliminate most of the heat-rays, to give visually mono-chromatic light, and to make the visual image approximately the same as the actinic image. By using this blue solution I believe I focus approximately the actinic rays; for I have used various objectives, both those corrected and those not corrected for photography, and have not once noticed a want of coincidence of visual and actinic foci. Further, I have focused with lamplight not passing through the blue cell and then photographed with the blue cell in place, getting a result quite inferior to the next, the next being obtained under the same conditions excepting that the blue cell was in place when focusing. The use of the blue cell in focusing secures excellent results with the Wales photo-objectives corrected for actinic light. After passing through the blue cell the light is received by a sub-stage condenser and focused on the object. My sub-stage not only carries ordinary Powell and Lealand achromatic and apochromatic condensers for high-power work, but by

means of adapters also carries, instead, an eye-piece or suitable objective for low-power work.

The round table-top expansion is divided by degree markings, Figs. 1 and 3, enabling me to turn the board supporting the lighting apparatus to any required angle for oblique illumination of transparent objects, or so far around, Fig. 3, as to cause the light to fall at suitable angles on

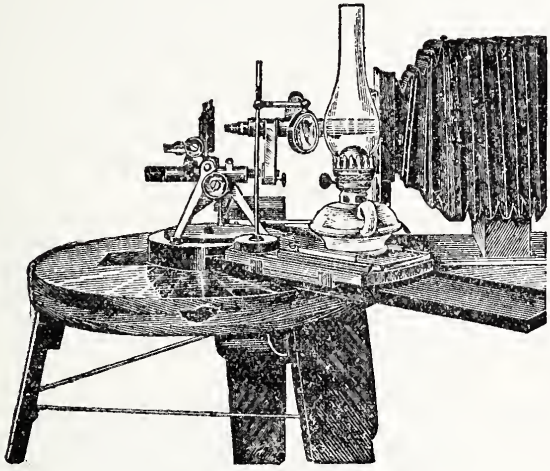


FIG. 3.

opaque objects. That end of the revolving board which is under the microscope is circular. The upper surface of the circular portion presents two levels, a central circular higher level surrounded by a peripheral lower level. On the latter rest the three feet of the microscope tripod, in such fashion that when the two feet away from the camera (those under the sub-stage), Fig. 1, are snugly against the edge of the central raised level the object on the stage is in a vertical axis about which the board revolves. Therefore, after the board has been turned out of line for oblique illumination, the microscope can be placed in new correct position immediately, by bringing the two feet mentioned against the edge of the higher level and the eye end of the axial tube to the centre of the camera front. In photomicrographing

an opaque object, a diaphragm cap of black cardboard is slipped over the front of the objective. Thus a diaphragm comes to be supported about half way between the object and the objective; it there cuts off all rays from the object and stage outside the area to be photographed, and is analogous to the hood of a portrait or landscape lens. When an objective has a short working distance, a piece of dead black card or paper with a central hold, instead of the cap, covers all the object except the area to be photographed. In photomicrographing, as in all critical optical work, it is important here and everywhere to shut out or suppress, so far as possible, every non-effective or wandering ray of light. The wainscoting of my room is black; the woodwork of the apparatus is black; the walls and floor are non-actinic; by day I always photomicrograph with covered windows; and at night I have no light in the room but that on the revolving board.

In Fig. 2 is seen a small cubical box projecting from the front board of the camera. Within the box is a mirror which reflects the light from a white card, substituted for the ground glass, through a single opera glass fastened to the near side of the box. With this addition to the apparatus in place, I can sit at the side of the table, arrange the object and illumination with the eye at the side tube of the microscope and then, without getting up, look through the opera glass and roughly focus an image on the white card. Focusing is then completed at the other end of the camera in the usual way. At the left are seen two screw-clamps, which are used in fixing the camera-back at any required distance from the microscope, the exact distance being shown by a scale cut on one side of the camera bed. The eye end of the tube is seen to be supported by an adjustable standard, a necessity in delicate work with high power.

Fig. 4 shows an arrangement of apparatus for photographing with transmitted axial sunlight. To the left is an upright supporting a horizontal axial tube with a portion of its upper half cut away to allow a water or alum solution cell, an ammonia-sulphate of copper solution cell, a disc of

ground glass, and diaphragms, one or more of these to stand in the lower half. The microscope is seen to the right. Between is an 8-inch portrait lens, so supported by an upright that its distance from the microscope can be varied at pleasure, by sliding the upright along the revolving board. The lens is attached to the upright by two sliding boards, one sliding vertically and one horizontally, for the purpose of centring. The portrait lens was originally intended to eliminate defraction phenomena in accordance with the Woodward method; but the lens is also occasionally used instead of a sub-stage condenser, an image of the sun being projected in the plane of the object. Outside a south window, Fig. 5, is a Stratton and Burrill heliostat on a shelf-table.

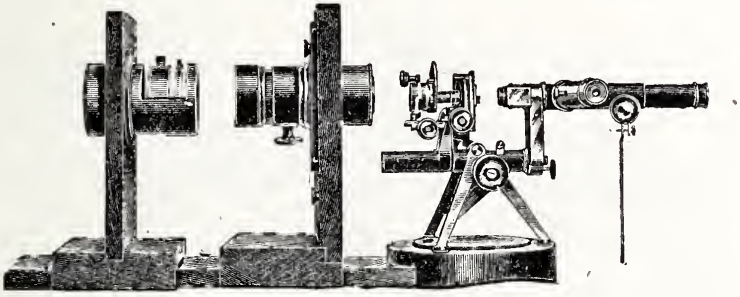


FIG. 4.

The window-sash is glazed with plate glass through which the light from the mirror passes without irregular refraction and reflection which occur when light passes through the wavy surfaces of an ordinary pane. The place for the heliostat is so marked that it can be within a minute accurately set and leveled over a meridian line cut in the surface of the shelf-table. I have neglected to say previously that the whole apparatus in the room is also accurately placed and leveled over an extension of the same meridian line cut in the floor. By referring to Figs. 1, 2 and 3, it will be seen that the table-top expansion is not directly supported by the three legs. The three legs support a ring, the two lower layers seen in the figures, into the lumen of which fits nicely, but freely, a circular plate of hard wood fastened

centrally to and below the table-top expansion. This construction permits the camera and microscope to be turned out of meridian while the revolving board remains in meridian, for oblique illumination with sunlight. On returning

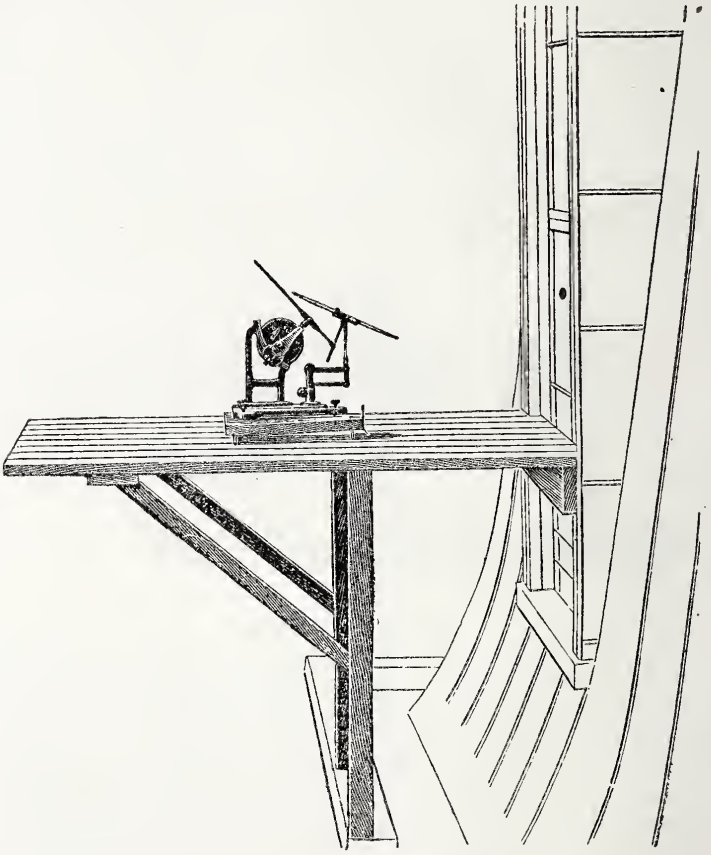


FIG. 5.

the camera support to the meridian, cleats on the floor stop the instrument in correct position. In photomicrographing opaque objects by sunlight the heliostat is moved to a meridian one foot to the east, as are also the water or alum and ammonia-sulphate of copper cells. The sunlight then

passes from the mirror through the cells and is received by a long-focus concave mirror which reflects it on the opaque object still in the first meridian.

Exposures are made in a very simple way. While the sensitive plate is being placed, a black card stands close to the ammonio-sulphate of copper cell and intercepts the light. When the plate is in position and all the apparatus satisfactory, the light-intercepting card is removed for the required length of time and then replaced.

## MODIFICATION OF THE SO-CALLED ENAMEL PROCESS OF PHOTO-ENGRAVING.

BY A. VILLAIN.

PURSUING our experiments on the employment of photography in printing tissues, it entered our mind to make some experiments with the enamel process, and with that process which appeared in the *Moniteur de la Photographie*, of March 15, 1895, in which ordinary glue is used for the coating of the plate to be etched. Rolls used for printing tissues and wall paper ordinarily are engraved by hand or mechanically by means of a tempered steel milling wheel or cylinder. They are also engraved chemically; the roll is covered with varnish on which the design is traced with a sharp point; the point cuts through the varnish and the copper is left bare.

Etching with nitric acid, to which a few drops of chromic acid have been added, follows:

The method due to Michaux is little used, owing to its cost. Efforts also have been made to transfer the design to these rolls by means of the carbon process, but the prints require too much care in developing and are difficult to obtain of a uniform quality. It is easy to see that the rollers covered with a coating of bitumen or any other sensitive composition cannot well be exposed under a negative, even when a flexible support as celluloid is used.

Realizing the many advantages of the enamel process, we

endeavored to avoid the inconvenience of the irregular exposure of a roller, and imagined that the coating, originally exposed and developed on a paper support, might be transferred to the roll. Our first experiments were conclusive, and it is this fact which leads us to make known this important modification.

A sheet of paper is coated with a 1 or 2 per cent. solution of gelatine and dried; or the ordinary commercial paper coated with gelatine may be used. Place the sheet for some minutes in a bath composed of

Water.....60 cc.
White of egg.....40 cc.
Bichromate of ammonium..... .... 3 grammes.

Drain off the excess of liquid and dry in obscurity, either in the open air or squeegeed on a clean glass plate.

When dry, expose under a negative or positive according as a relief plate or intaglio is desired. Of course, a line negative, or one made with a screen plate, must be employed. When sufficiently exposed, say eight to ten minutes in diffused light at this season of the year (June, 1895), the print is developed. It is placed in a tray containing cold water, which is renewed from time to time to eliminate all the soluble salts of chromium. Afterward hot water, boiling even, is used, to dissolve completely all the gelatine not rendered insoluble by the action of the light. Better to follow the development; a little eosine or other aniline derivative may be added to the running water, which renders the image visible. *No gelatine should remain on or in the paper save that which has been acted upon by the light.*

The development finished, and the print perfect in detail, it is squeegeed wet on to a copper plate or roller, or even brass or zinc, taking care to avoid any air bubbles; this done, it is allowed to dry and is then burned in without removing the paper support. The print may be allowed to dry before transferring, but care must be taken in this case to soak it well in warm water, before transferring, to permit the gelatine to recover its feeble adhesive power.

The burning process is as follows: The plate, with its sheet of paper, is placed on a piece of sheet iron somewhat

larger than the plate, and the whole placed over a gas stove, or heated in any other manner. The heating should proceed very gradually until the paper is completely carbonized; the temperature may even attain 400 deg. C.

In order to judge better if the temperature necessary for the proper baking of the enamel is reached, two small pieces of lead may be placed upon the sides of the plate. When the lead is melted, the plate may be removed, if the paper is burned, otherwise the plate may be heated to a still higher temperature. If thin paper is used as a support it is completely destroyed. It is preferable to allow the paper, after transferring, to dry perfectly before firing. The paper carbonized, the plate is allowed to cool gradually, and what paper remains may be removed with a tuft of cotton, wet or dry.

The high temperature necessary may be a difficulty, for it is not easy to heat a roll on a plate. A means of overcoming the trouble is to support the roll on two end centres, as in a lathe, and the roll is revolved within a wrought- or cast-iron tube, the latter being heated by a gas flame, or otherwise. In the etching process the tube is replaced by a trough containing the per-chloride of iron, or other corrosive chosen.

The advantages of this process are immense: the doing away with the reversed negative; the facility for obtaining prints; relieving the amateur from the trouble of coating the plate with the gelatine solution; the possibility of sending to the engraver a collection of prints of which he would undertake the work of transferring and etching.

We urge our readers to make a trial of the process; they will certainly be convinced of its easy execution and the advantages above enumerated.

## A SIMPLE LANTERN-SLIDE CAMERA.

BY H. C. DELERY.

IT has often been a matter of perplexity to the lantern-slide-loving amateur, as to how he should make his slides. An enlarging box is rather an expensive luxury, and it is not always that there is a camera club at our convenience where we can have the use of one, and even then we very often find that the box is being used by some one else when we desire to employ it.

It occurred to me that a box, easy to make, costing but little or nothing, could be made, and with that end in view have arranged one described below:

We must first procure a board, say, 5 feet 6 inches long by 17 inches wide, 1½ inches thick, Fig. 1. On this we place our grooves in which slides negative carrier, Fig. 4. These grooves are made of ½-inch boards, as shown in detail, A, Fig. 6. It will be noticed that one side of grooves is made wider and has a slot cut through it; this is to receive the clamping screw to fasten negative carrier, Fig. 4, when negative is focused.

The negative carrier, Fig. 4, is a frame made of ½-inch thick wood, which slides in grooves above described, and shown in B, Fig 6, is also arranged to slide sideways, letter C, Fig. 8, in order to centre the negative on ground glass.

These grooves are made in a similar manner to those on board D. It will now be noticed that we have a frame which can be moved backward and forward on board D for focusing, and from side to side for adjusting negative in centre of ground glass. The negative carrier is made of two uprights with a small strip nailed on each side, which allows the groove to receive the negative holder E, Fig. 4. A section of this frame is shown in Figs. 5 and 7, and detailed in F, Fig. 9. The negative carrier E, Figs. 4 and 9, is made of a plain board 10 inches square (for 6½ x 8½ negatives), with opening cut in centre $\frac{3}{16}$ inch smaller than the negative to be used. The receptacle for negative G, Fig. 9, is made in same manner as other groove; the negative is



FIG 10

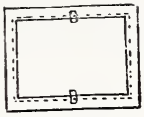


FIG 11

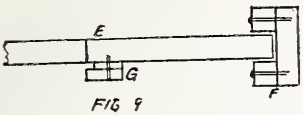



FIG 9

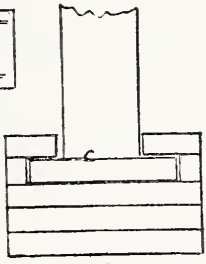



FIG 8

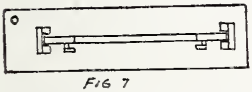


FIG 7

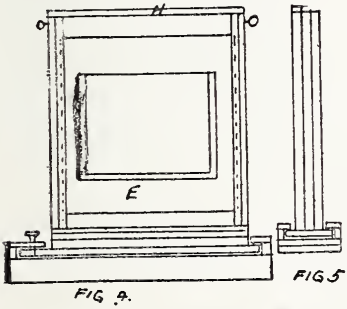



FIG 9.

FIG 5

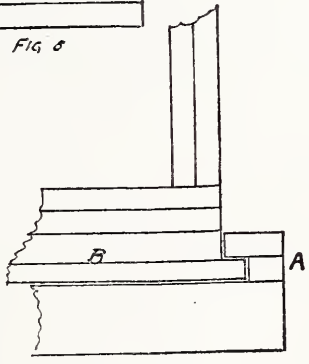



FIG 6

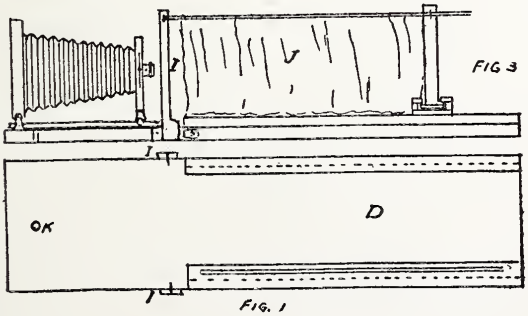



FIG. 1

FIG 3




FIG 2

A SIMPLE LANTERN SLIDE CAMERA.

slipped in from the top and falls in position in the grooves. A strip, H, across the top, Fig. 4, finishes the frame.

It will be noticed that the negative holder E, is made square, in order that we may reverse it if we wish to make a vertical picture. It is also arranged so as to be raised or lowered in the frame. A small strip of black cloth nailed on top bar, H, prevents all light from coming to the lens. Another small frame, I, Figs. 1, 2, 3, concludes our apparatus. This is provided with two eyes at the top to receive a rod on each side, which is in turn passed in another eye on negative carrier. These rods are placed in position to hold the dark cloth J, which excludes all light from the lens. All that remains to be done is to screw the camera to board at K, Fig. 1. Any camera may be used, either front or back focus.

In order to facilitate matters, I have a cardboard which fits on ground glass frame in camera, and in the centre of which is cut the largest size mat opening, so that we may see the exact picture we shall have when slide is finished, Fig. 10.

The above box is made for 6½ x 8½ negatives; a smaller size plate can be used in same box by making a kit of two cardboards glued together, one the full size of negative, the other a trifle smaller. The plate is held in position by a small metal clip pivoted, Fig. 11.

Kits for holding lantern-slides in our regular plate holder are made in a similar manner, Fig. 11.

When not in use, the apparatus can be stood on end in a small corner, and occupies but little space; the frame I, being folded down and the carrier E slipped out of the groove.

It takes but a moment to replace everything in working condition.

## A FEW NOTES FROM MY SCRAP-BOOK.

BY DR. NELSON B. SIZER.

THE new "Primus" bottle clip is a thing we ought to see on sale here. Imagine a capital letter T made of sheet brass, the horizontal arms being bent forward in a circle to hold the body of the bottle, while the lower end of the vertical arm is bent forward at a right angle to form a rest for the bottom. A couple of screw holes finish the thing. It is screwed to the wall, or front of a shelf, and affords a safe and convenient pocket for the bottles in use in the dark-room. The cost in quantity would be very light, and any ingenious amateur can make them very easily.

*Concentrated "Hypo" Solution* is very useful and is best made by dissolving 4 pounds in 44 fluid ounces of water by heat, filter through absorbent cotton, and add enough water to measure 80 ounces. Of this, 5 fluid ounces is equal to 4 ounces avoirdupois of the dry salt.

*A Good Matt Varnish.*—From long use I recommend this formula—

| | |
|---|---|
| Sandarac | 1 ounce Troy |
| Mastic | 90 grains |
| Ether | 10 fluid ounces |

Mix and dissolve, then add

| | |
|---|---|
| Benzine | 4 fluid ounces |

If the negative gives too harsh contrasts, tint the varnish by dissolving 10 grains of "malachite green" in a fluid ounce of strong alcohol, and add a few drops of this green solution to the varnish until you find it sufficiently tinted to produce the required effect.

*In Obscuring Skylights*, why do not our friends use crystallization, instead of putty, whitewash, and other makeshifts? Make a saturated solution of "Epsom salts" in hot water, and apply hot to glass by sponge or wide varnish-brush. The result is both beautiful and effectual. Try it, brethren!

*The Metol Developer* is perfection for bromide *paper*, but I find plates are apt to have too little density to print well. To remedy this, I find the following a good thing. It is in two solutions :

A.

| | |
|---|---|
| Metol | 40 grains |
| Hydroquinone | 60 grains |
| Sulphite of sodium | 10 drachms Troy |
| Water | 10 fluid ounces |

Mix and dissolve.

B.

| | |
|---|---|
| Sodium carbonate | 5 drachms Troy |
| Water | 10 fluid ounces |

Mix and dissolve.

In practice, use equal parts of A and B. If we wish to avoid trouble, we must always use *distilled* water, as the ordinary article is both variable and uncertain. Caution! "Metol" sometimes irritates, so keep fingers out of it as much as possible and rinse them soon after use.

*A Perfect Anti-Halation Fluid* is the following :

| | |
|---|---|
| Hard soap in shavings | ½ Troy ounce |
| Alcohol | 10 fluid ounces |

Digest at ordinary temperature and shake for seven days, filter, and dissolve in the filtrate 50 grains each of "erythrosine" and "aurin." Apply to back of plate with brush and dry. If only a few of these plates are developed in the same batch of developer, it is not essential to previously remove this backing. If you develop too many at a time, the films may be stained pink ; in such case wipe off the coating before developing.

*Waxing Solution for Glass.*—For use previous to enameling prints by squeegeeing on plate glass or other polished surfaces, I find none better than spermaceti, 120 grains, dissolved in benzine, 10 fluid ounces, with a drop or so of citronella or other fragrant oil to improve odor. In hot weather such prints are apt to stick. The only remedy is clean glass, the use of an efficient waxing solution, and an alum bath for the prints, say 2 ounces to the pint, in which they remain fifteen minutes, and are afterward well drained and washed.



Copyright, 1895, By A. L. Eidemiller

Utica Engraving Co.

"REFRESHMENT."

By A. L. EIDEMILLER.

*A Good One Solution "Hydroquinone" Developer* is this:

| | |
|---|---|
| Hydroquinone | 10 grammes |
| Sodium sulphite | 30 grammes |
| Potassium ferrocyanide | 25 grammes |
| Water | 200 c.cm. |

Mix and dissolve, then add

| | |
|---|---|
| Caustic potassa | 30 grammes |
| Water | 60 c.cm. |

and dissolve.

In use, one part of this is diluted with 10 to 30 parts of water.

*A Reliable Mountant.*—I find few superior to the old "library paste." This is 7 parts powdered tragacanth and 1 part powdered gum acacia, with water enough to make it the proper consistence. A drop or two of clove oil or carbolic acid, or a few grains of boracic acid will prevent fermentation or mould.



SECRET CORRESPONDENCE. BY C. H. WHITE.

# OUR FAITHFUL FRIEND.

BY E. LINGAN BOWLUS.



By Alfred Stern.

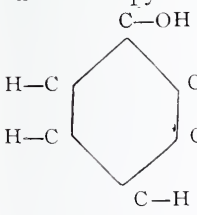
ONE of the many misnomers found in the chemical nomenclature of the present day is the name "Pyrogallic Acid." The absolutely pure article should have no acid reaction whatever if the absence of the characteristic group of organic acids — the carboxyl group, CO.OH.— precludes all possibility for the exhibition of acidic properties. This group is characteristic of all organic acids, and consists of one atom of quadrivalent carbon, three of whose affinities are in direct union with two atoms of oxygen, and indirectly with one atom of hydrogen. It is written thus: —CO.OH more diagrammatically thus: $-C^{=O}_{-OH}$. Both formulas show one bond or affinity which is free to unite with some organic or inorganic radical.

As obscurely hinted at above, this group is absent in pyro. There is present in pyro only the group —OH, which may be considered as one of the component parts of the carboxyl group; for on second examination we find the carboxyl group, $-C^{=O}_{-OH}$, made up of two groups: a carbonyl group, C=O, and a hydroxyl group, —OH. The absence of this entire group, is beyond doubt, the presence of the —OH groups, without dispute.

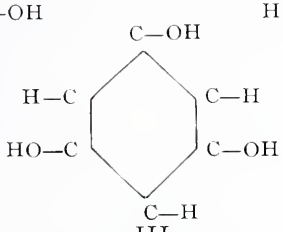
It is probably due to two chief reasons that pyro has been called "pyrogallic acid." First, there is a simple, direct, relation (as will be seen later) between pyro and (phenol, or) carbolic acid, $C_6H_5OH$, which, unlike the hydroxyl compounds of the methane series, has a marked affinity for

strong bases, such as potassium and barium, to form potassium and barium phenolates ($C_6H_5OK$ and $(C_6H_5O_2)_2$ Ba+ $_2H_2O$). Such an affinity as this is a peculiar property of all true acids, and not of hydroxyl compounds. Second, pyro can be obtained from gallic acid (a true organic acid) by heating up to a high temperature. Since this transformation is accomplished by fire, the product is called pyrogallic acid —fire gallic acid—from a Greek word meaning "fire."

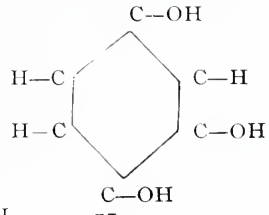
Theory indicates three isomeric, tri-hydroxy, substitution products of the benzene (Sec '95 ANNUAL, page 180, "Structure of Hydroquinone") molecule, one of which is our faithful friend pyro. These substitutions are as follows:




I.




III.




II.

They are to be regarded only as diagrammatic representations of the atomic relation of three theoretical, trihydroxy, substitution products of benzene. They have the same molecular formula, yet may differ in chemical and physical properties. Of these, No. I. is supposed to represent pyro or pyrogallol.

This developer differs from hydroquinone, $C_6H_4(OH)_2$, in the possession of an additional OH group; from phenol, $C_6H_5OH$, by the possession of two extra OH groups. Thus we have hydroxyl substitutions of benzene in an arithmetical progression from phenol to pyrogallol. It is probably this simple relation between phenol—a so-called acid—and pyrogallic acid that may have had some weight in naming the compound.

It may be interesting to some to know that these three

compounds of the "benzene series" have strictly analogous compounds in the "methane series," which compounds are, with one exception, in common use. Thus corresponding to phenol ($C_6H_5OH$), there is ordinary *alcohol* ($C_2H_5OH$); to hydroquinone, is *glycol* $\left\{\begin{matrix}CH_2OH\\ \|\\ CH_2OH\end{matrix}\right\}$, and to pyrogallol is *glycerine* $\left\{\begin{matrix}CH_2OH\\ |\\ CH\,OH\\ |\\ CH_2OH\end{matrix}\right\}$. The fundamental difference between these two series is in the carbon inter-atomic linkages; that of the benzene series is a closed chain, while in the methane series there is supposed to be an open, or straight chain of atomic affinities.

Pyrogallol is formed by the dry distillation of gallic acid, which, in turn, is prepared by the fermentation of gall nuts, or by melting brom-protocatechnic acid with caustic potash.

The reaction in the dry distillation of gallic acid is as follows:

$$C_6H_2\left\{\begin{matrix}(OH)_3\\ [CO.O]H\end{matrix}\right\} = C_6H_3(OH)_3 + CO_2$$

Gallic Acid — Pyrogallol — Carbon Dioxide.

It is highly probable that the gas $CO_2$ (carbon dioxide) results from the decomposition of the carboxyl group [CO.O]H, as shown by the brackets, since the elements necessary to form $CO_2$ are found in this group in more intimate space relation than in other portions of the molecule. The remaining hydrogen atom unites with the carbon atom of the benzene ring, thus supplying the one free affinity of this carbon atom



By Harry and Marie Platt.




Photographed from Nature by Fred Graf.

THEN THE MOON IN ALL HER PRIDE,
LIKE A SPIRIT GLORIFIED,
FILLED AND OVERFLOWED THE NIGHT
WITH REVELATIONS OF HER LIGHT.

—LONGFELLOW.

# PHOTOGRAPHIC STUDY OF CHILD LIFE.

BY BERTHA M. LOTHRUP.



Copyright, 1895.
Child Study. By Bertha M. Lothrup.

IF THERE is no branch of photography to me so interesting as the study of child subjects, and when one has secured the confidence of children it is possible by devoting a little time and patience to use them in many charming pictures.

Of course it is not every child that will be docile and friendly at first, especially with strangers, but by carefully studying a child's nature one can generally win its confidence in a short time.

With some children any approach on the part of the photographer would only increase its timidity, and such a subject must be managed through a third person---the mother, for instance. Others want to have a good romp on first sight; the more noise the better.

The studying out of their natures is not as some may imagine an unpleasant feature of the work. To associate with them, enter into their thoughts, gratify their whims, in fact to be one with them is the best way to secure their

co-operation. Their very restlessness, and at times obdurateness, lends an uncertainty to the work of photographing them that relieves it of monotony and brings with every effort a new experience.



Copyright, 1895.

GRANDMA'S PET. BY BERTHA M. LOTHRUP.

To one deeply interested in children it is often amusing to see the looks of delightful expectancy on their faces when about to be photographed; how willingly they will assume tiresome positions, submit to many absurdities of

costume and cheerfully lend their assistance to making the picture just for the sake of being in it. This great desire



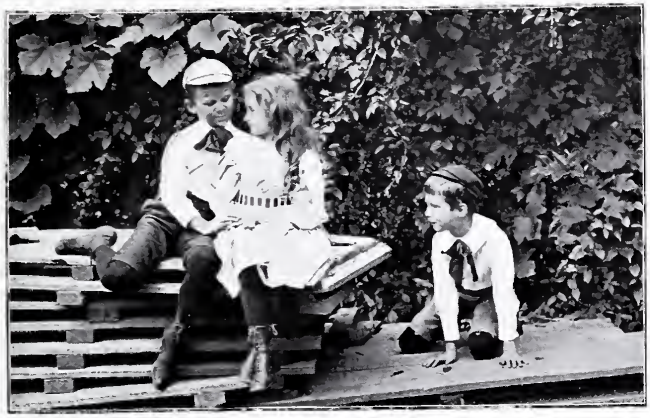
Copyright, 1895.

AFTERNOON TEA. BY BERTHA M. LOTHRUP.

in the young to be photographed is accounted for by the fact that the process is a wonder to them and they cannot understand how their faces can be transferred to paper. As a rule I prefer to use flash-light when photographing children, for in this way I can secure many interesting and comical pictures in their homes, not being dependent on bright corners or daylight, but can snap them at any time without keeping them perfectly quiet.

The progress that can be made by the studious worker is one of the greatest incentives to following up photography,

and in child life I have found a large and productive field for work.



JEALOUSY.

Copyright, 1895.
BY BERTHA M. LOTHRUP.

## ORTHOCHROMATIC PLATES WITH COLOR-SCREENS.

BY GEO. A. SAWYER, U.S.N.

SOME years ago—four or five I think—I received from Carbutt a package of orthochromatic plates, the first I had seen. I was at the time interested in making studies of plants and flowers by photography and looked to the commercial introduction of the ortho plate as a valuable accessory to such work. I used a few of the plates but was disappointed in the result. The plates seemed to me to be harsh and present too violent contrasts quite out of keeping with the soft delicacy of the subjects for which I required them. Further experience leads me to the conclusion that the defects I attributed to the plates were probably due to errors of exposure or development, and since then I have used ortho plates in larger proportion each year, and with increasing satisfaction, till I now use them exclusively.

While there is an appreciable advantage in ortho plates

over plain bromides for all subjects, it is only when used in conjunction with a color-screen that their full virtues are brought forth. Unfortunately a color-screen involves prolonged exposure and therefore its use is restricted, but for entire satisfaction it is indispensable, and if one has the time it is always worth while to make the opportunity for its use.

A pale yellow screen prolongs the time of exposure five or six times, but with the most rapid plates for use out-of-doors, in the summer time, with a fairly large stop, one can sometimes make a drop-shutter exposure and get a negative capable of yielding a beautiful print. This indicates that under the favorable conditions enumerated a color-screen may be brought into more frequent use than is usually thought. In fact, I make one the invariable accompaniment of my camera for all occasions except special drop-shutter excursions.

One objection which there seems to be the more frequent use of the color-screen is the bother of placing it back of the lens within the camera, as is usually recommended. This I avoid by simply attaching the screen to the front hood of the lens by two rubber straps, an arrangement which permits its attachment or displacement in an instant, and which seems to answer perfectly.

In the first place I made a frame of light slats for a background, covering it with patches of colored cloths to match as nearly as possible the prismatic colors and of nearly the same color values. On this surface I fastened a big sunflower with green centre, orange and brown florets and bright orange petals. The result speaks for itself.

The ordinary bromide plate represents the color values with the greatest departure from nature. In fact no color but red had its proper weight. The blues, in the upper part of the background, are too light, and some of the greens are too light and some too dark. All the yellows and oranges are took dark. The plain ortho plate corrects some of these defects, notably in the greens, while the ortho plate and the color-screen is still nearer the truth of nature, and may be accepted as the nearest approach to more light and shade the means at present at command enable us to reach.




Sanders Engraving Co. Walton Lackaye.

SVENGALI.
BY NAPOLEON SARONY.

Color-screens are not usually recommended as necessary for landscapes, but suppose we have a grass field full of apple trees to make a picture of the grass is a yellow-green, which will photograph quite as dark as the deep foliage of the trees, and the resulting picture will be flat and devoid of the contrast and truth of nature.

In such a case and in numberless others in pure landscape work a color-screen will be found invaluable.

But enough has been said to call attention to the subject, and I am sure the intelligent experimenter will be delighted with the results.

## ATOMIZER VIGNETTES.

BY EDWARD W. NEWCOMB.



G. F. Whitmore.

SOME time since I wished to make some irregular vignettes such as one sometimes sees in the magazines with a bit of poetry, playing hide and seek in and out of their delicate, straggly gradations; but cut, paste and paint as I would I could not produce the effect I wanted by the ordinary means. Various books were searched, and several "grandfathers of photography" were taken into consultation, but no simple method resulted until I bethought myself of the atomizer. The atomizer idea is, I think, original with me; no one, to my knowledge, has advocated its use.

It is necessary to procure an atomizer with a very small hole at the point so the spray will be *spray*, not drops. No metal should touch the inside, hard rubber tube and rubber stopple are best, and are readily to be had, though a round dozen may have to be tested before one with a really fine spray is found.

The paper to be sensitized should be hung vertically, and, if very thin, pinned at the four corners. To apply the sensitizer, fill the atomizer about a third full and, standing a foot or so away, direct the spray at the paper about where the heaviest printing is required. By drawing nearer or receding any degree of gradation of coating can be applied. Any excess of sensitizer in the centre should be worked in with a badger blender. After a few trials, if the atomizer sprays fine enough, it will be found extremely easy to obtain any form of vignette, from the staid, conventional old pear or oval to the most delightfully irregular article that ever was printed.

Silver, kallitype No. 1, uranium or blue prints, can be made in this manner in exceedingly artistic combinations and menus, souvenirs, note paper, and a hundred like articles, can be produced astonishingly well, giving the effect of wash drawings rather than of photographs.

For plain silver prints use Clemon's salted paper or extra heavy Whatman salted, and a solution composed of

| | |
|---|---|
| Silver nitrate | 35 grains |
| Ammonium nitrate | 10 grains |
| Water | 1 ounce |

Tone and fix seperately, or for warm, yellowish-brown tints, simply fix in a one to ten solution of hypo soda.

For Kallitype No. 1, fill the atomizer with the sodium ferric oxalate solution (see formula at end of this book), and develop in the silver solution as directed.

Uranium prints are made with a 60-grain to the ounce solution of uranium nitrate and developed in a weak solution of red prussiate of potash. As this kind of a print has a tendency to look "sunk in" it is best to use well sized paper.

For blue prints a very small amount of solution should be mixed, as it does not keep well. All not used should be thrown away in a day or two. Use

| | |
|---|---|
| Ammonia citrate iron | 16 grains |
| Water | 2 drachms |
| Red prussiate of potash | 12 grains |
| Water | 2 drachms |

Mix the two, and when thoroughly dissolved filter into the atomizer.

Separate atomizers should be used for each process.

## WHAT SIMPLE BATH SHALL WE USE FOR COLLODION ARISTO PAPER?

BY T. VON NORATH.



E. Eliot.

IT IS a universally known fact that, in Germany at least, when celloidin paper is employed, a sulpho-cyanide of ammonium toning bath is used. This would give the impression that the sulpho-cyanide of ammonium is the only bath which will tone collodion and aristo papers rapidly and satisfactorily, which is by no means the case.

I have made a great many experiments with simple baths, both with and without sulpho-cyanide of ammonium and have found, when proper care is exercised, that others than sulpho-cyanide baths are more suitable for collodion paper.

It may be mentioned first that when toned in baths containing sulpho-cyanide of ammonium or sulpho-cyanide of potassium, the prints lose very little intensity on fixing. Certainly the delicate half-tones are not lost, but the whites are not as clear.

It may be observed further that sulpho-cyanide of ammonium easily decomposes hyposulphite of soda, and under certain conditions combines with the silver-forming salts, hard to be eliminated, and which may have an injurious effect on the prints. Certain it is that, when a toning bath is used, which contains much sulpho-cyanide of ammonium, if the bath is not well washed out before fixing, the hyposulphite of soda in solution may be decomposed.

The sulpho-cyanide bath generally should be avoided on account of its poisonousness. The consequences of using this bath show themselves in paralysis and diseased conditions of the nervous system. On these considerations I now employ a toning bath originated by myself. I found that, with these, very beautiful tones could be obtained on collodion and gelatine aristo papers. The principal point to be observed is that the printing should be somewhat deeper than is necessary when the sulpho-cyanide of ammonium bath is employed, since the prints fade somewhat in the fixing bath. The prints should be thoroughly washed to remove all free silver and every trace of free acid, after which they may be toned at once.

One great advantage is that the progress of the toning may be followed without removing them from the bath, as the tone they assume appears the same whether viewed directly or by transmitted light, and these tones are not changed perceptibly in the fixing bath, so that toning the prints is reduced to an absolutely certain operation.

After many experiments I settled upon the following formulæ as giving the most suitable baths both for the professional photographer and for the amateur.

| | |
|---|---|
| Water | 100 parts |
| Solution of chloride of calcium (1 : 10) | 5 parts |
| Solution of chloride of gold (1 : 200) | 5 parts |

This easily prepared bath gives beautiful bluish tones.

| | |
|---|---|
| Water | 100 parts |
| Solution of benzoate of soda (1 : 10) | 7 parts |
| Solution of chloride of gold (1 : 200) | 5 parts |

This bath gives tones ranging from violet to violet-black, and keeps well.

Whether the paper prints red or blue has a certain effect on the tones obtained. The ease with which the baths and stock solutions can be prepared is an advantage, and the fact that the greater part of the silver is replaced by gold augurs well for the permanence of the prints. The purity and uniformity of the tones cannot be surpassed. The toning proceeds with tolerable rapidity, and is easily controlled, and therefore requires little practice.

# THE PHILOSOPHY OF DEVELOPMENT.

BY W. J. STILLMAN.



W. E. Peabody.

EMPIRICAL development is a simple matter and requires only dexterity to cover the plate at a movement so that entire equality of action may follow, and the perception of the right time to stop. All this may be acquired in a single lesson by any person gifted with common sense, but like other empirical operations, the good result is a matter of chance, full success depending entirely on the exposure of the plate being exactly what the development is precisely adapted to, over-exposure as well as under-exposure resulting in an imperfect negative. This fact is evident to the merest tyro, but the fine skill of the expert, the true art in photography, is in the ability to adjust the development to the varying condition of exposure, as it is found to result from the accidents of lights and the necessities of the subject. The philosophy of development is based on the relation between two distinct elements in the photographic result; the impression made on the film by the light, and the chemical action of the developer, and the variation in the relations between the two will determine the quality of the negative with a range of power which very few operators are aware of. To give a case in illustration, which recently occurred in my own practice, the photographing of a badly freckled face: how shall we reduce the mottled effect to the minimum? I have tried isochromatic plates without the least benefit, and in most cases with a worse result than the ordinary plates gave, for the reason that they are very much slower and have the same effect as the shorter exposure on the latter. What we want in this



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QUEEN OF SHEBA."

By CHARLES I. BERG.

PRINT,
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PHILADELPHIA.

case is the greatest possible equalization of the action of the light, and this is obtained by the prolongation of the exposure) just as in the case where we want the reduction of the contrasts of light and shade and giving the shadows the full benefit of the exposure they require) and then adapting the force of the developer to the necessities of the case. Thus I found that a short exposure and a strong development gave the maximum of spottiness to the freckled face, while a prolonged exposure and the use of a weak developer gave the minimum. If under these circumstances we want what is called a "brilliant" head, we must manage the reflections and lighting so as to give the most possible contrast in the light and shade. In the case in question, I gave 6 seconds exposure, though half a second would have been enough with the maximum strength of developer, and used an old and slightly discolored developer, hydrokinone with a trace of metol. This gave me a negative with so slight marking of the freckles that the retouching to get rid of them was very little. I hear a good deal said about the advantage of isochromatic plates for the equalization of color values in landscape, but I have never found any advantage in their use which was not more easily obtained as in the above case by the long exposure and weak developer.

But there are cases in which the short exposure is inevitable, *i.e.*, in which we must work with what we can get, and this sometimes insufficient. In this case we must seek in the selection of the developer an action analogical to that in the other and above stated case. This is given us by developers like glycine and metol in which the action is penetrating and mild, rather than intense and contrasting, as with pyrogallol and hydrokinone. The very common statements in favor of this or that developer in comparison with others that they will do with half the exposure are all nonsense. I have tried, systematically and with the greatest precision, the power of all the developers introduced to the market, and I do not believe there is 5 per cent. difference between the developing value of oxalate of iron, iconogen, amidol, paramidophenol, glycine, metol, hydrokinone and

pyrogallol. The slight difference which may exist is in favor of pyrogallol, glycine being ranked with it for the the power of rendering the faint radiations, and metol slightly behind. But pyrogallol gives an image of the maximum printing density, and the extreme of contrasts in the local differences, while glycine gives a minimum, which in cases of sufficient or over-exposure is not conducive to good results. Pyrogallol, in cases of minimum exposure. has a tendency to make impenetrable lights and weak shadows; Glycine requires a very exhaustive development to give sufficiently dense lights before the weakest shadows are out. So far as I know I was the first to study out the advantage of the mixed developers, as communicated long ago to *The Photographic Times*, and the practice grows on me. I cannot recommend the mixture of any of the inorganic, as I suppose we may call the coal-tar, developers, with pyrogallol, but hydrokinone mixes well with all of them, and for common and studio practice I find it the most convenient, mixed with about one-tenth of its amount of metol, *i.e.*, when made up in a stock solution I make it with 10 grains of hydrokinone to 1 of metol. An advantageous method of using glycine is to allow the developer to act till the detail in the deepest shadows begin to appear, and then pour it off and apply a developer of hydrokinone that has been used and partly exhausted with which push the intensity to the desired point, for the image developed with glycine alone is hardly vigorous enough to give a brilliant positive except where the exposure has been barely sufficient.

Pyrogallol has one advantage over all its competitors, the color of the negative is strongly non-actinic and the negative may be left very thin to appearance; while if it be found too vigorous in printing, bleaching with alum and acid is the simplest, safest and most unobjectionable method of reducing it. If used for extremely short exposures from which a strongly contrasted negative might be expected, it will give all that any developer can, but it must be used of a strength not above one-half of 1 per cent. and may even be made of half that strength. But it is not adapted to very hot weather, as I find here in Rome in the summer. Glycine,

on the other hand, has the advantage that it can be kept on the plate almost indefinitely without decomposing, fogging or producing cloudy markings. I have tested it by leaving the tray with the plate under development covered from the light while I went on with the development of two or three other plates, without any injury being inflicted on the so-covered plate, either by fog or the markings due to not being rocked, while with some developers, and especially pyro, it is impossible to leave a plate in this way without finding it covered with minute cloudy markings. Glycine alone seems to have no power to affect the haloid which has not been impressed by light, and it is this quality that makes it so safe for the development of minimum exposures. The addition of metol I have found to induce fog under extreme pushing.

It is therefore absurd to make a rigid rule of development, and accept a standard developer for all occasions, unless we can control the occasions, as in the portrait work in a gallery. A developer which I find to have the widest range of usefulness is one of hydrokinone and metol, of the strength of ½ per cent. of the former and $\frac{1}{20}$ of the latter, 2 per cent. of sulphite of soda and the same amount of carbonate of potash. If more convenient it may be kept at that strength in carefully stopped bottles and when used rebottled for future use where a weaker, or tentative development is needed, as in cases when we do not know what the exposure has been, for it can be safely replaced by the normal if found too weak, and by a still older one if too strong. I have had brilliant results from long exposures on a landscape with wide distances and subtle gradations, using a developer of this formula which had served for repeated developments until quite brown. This formula seems capable of indefinite keeping, for I do not find that unless allowed to remain in bottles partially full or without a stopper, it loses its qualities however long kept.

I add a formula for a stock solution of glycine which will be found convenient for instantaneous exposures:

Water, 500 grammes; sulphite of soda, 200 grammes; carbonate of potash, 200 gs. Dissolve in boiling water,

and stir in 100 grammes of glycine and 10 grammes of metol, continuing the boiling till all is dissolved. When cold, filter and put in small bottles well corked. For use, dilute one part of the stock solution with from 10 to 20 parts of water and a trace of bromide. If for use with solio or other gelatine paper the image resulting from the above will be strong enough, but if wanted for albumenized paper pour off the glycine and rinse the plate, after which continue with an old hydrokinone developer with a few drops per ounce of a 10 per cent solution of bromide.

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## BETWEEN THE FIXING BATH AND THE PRINTING FRAME.

T. J. KOMMERS.

IT goes without saying, that in order to secure a good photographic print, a good negative is required. If the exposure be much too long or too short, or the development be carried too far or not far enough, it will be impossible to secure the best results. It pays, therefore, to devote some time and a few plates to learn just what conditions one's camera and favorite plates require. Experiments can be made at little cost by cutting up plates into strips with a five cent glass cutter. A strip an inch wide is as good as a whole plate for an experiment.

By all means let the amateur do his own developing, even though he does not make his own prints; it is the only way to learn to correct one's mistakes; and who is there that does not make mistakes? Moreover, knowing under what conditions the exposure is made he will be able to adjust the proportions of his developer better than any one else.

But having secured as good a negative as possible, there are probably still some defects which can be corrected before printing. A speck of dust on the plate, or a bubble in the developer, or an unintentional scratch has left a little clear spot in the negative that will be a black one in the

print; or the lights and shadows are too harsh, or some outlines need to be altered in order to have a more pleasing effect; or certain parts of the negative are too thin.

In the first case a fine camel's hair brush with a little India ink, or "Gihon's Opaque," may be so applied as to correct the fault. If the spot appear too white in the print, it can be darkened in the same way after the print is mounted, but before it is dry; it is better, of course, to do it just right in the first place.

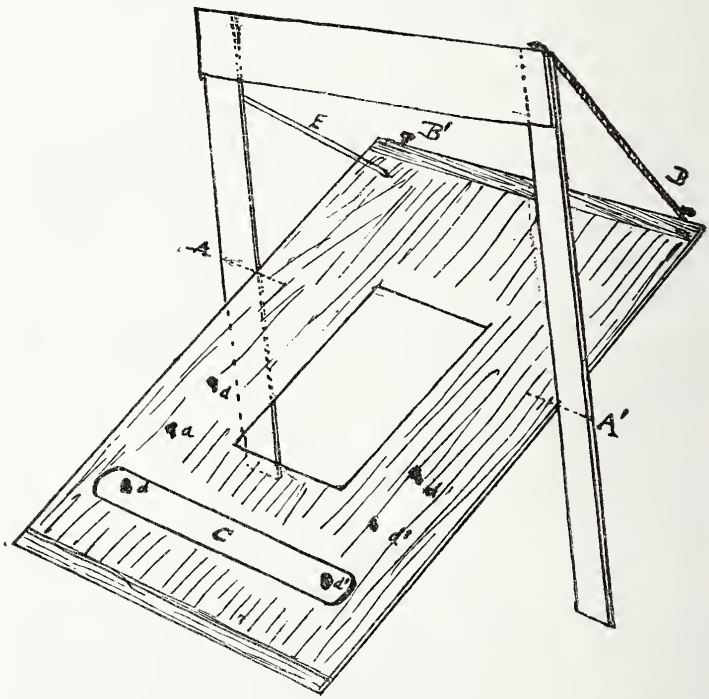
In the second and third cases we must "retouch," that is darken the parts that are too light by penciling. A drop or two of the "retouching medium" (formula 86, PHOTOGRAPHIC TIMES ANNUAL, 1895, page 294), is quickly and evenly rubbed over the film with the ball of the thumb. After some hours this will be hard enough to work upon. A drawing pencil—Faber HHHHH, or softer for darker effect—is rubbed to needle sharpness on fine sandpaper or ground glass, and by rapid but minute strokes the necessary density is obtained. Thus harsh contrasts can be softened down, false lights corrected, and unpleasant outlines modified. If not satisfactory, the work can be rubbed off with spirits of turpentine.

In the last instance we must work upon the back or glassy side of the negative. We can take a cake of moist water color—indigo—and wet the tip of the finger and so daub as evenly as possible a coating of blue over the thin parts of the negative; or we can dampen a piece of tissue paper and gum it by the edges to the negative, and then darken with leadpencil or crayon the parts we wish to brighten. Whenever we have worked upon the back of the negative we must cover the printing frame with tissue paper.

All these things can be done without a retouching frame, but not so well. A simple frame may be made as follows, and when not in use may be folded up and put out of the way:

The main part of the frame is a piece of half-inch wood, about 12 x 18 inches, with strips of the same stuff nailed on the ends to keep it from warping. In the middle a hole is cut of whatever size desired, but smaller than the negative. A thin piece, *c*, serves as a support to the lower edge of the

negative; this piece is held in place by the pins or tacks *d*, *d'*, and shifted as necessary. A frame is pivoted to the board by two wire nails at *a* and *a'*, eleven inches from the bottom of the board and seven inches from the lower end of the frame; a cord at *b* allows the frame to open to the desired distance; a little piece, *e*, holds it firmly open, but when this is removed the frame shuts up flat. When using it the frame is placed




upon a table by a window; some white paper placed beneath the opening reflects the light, and the focusing cloth or any other dark material is thrown over the top and sides to shut out false light from the eye of the operator. The pins *b*, *b'*, coming through two small holes in the cloth, serve to keep it in place. A piece of dark paper, in which a hole has been cut an inch or so in diameter, is laid over the negative

when retouching, so as to protect the film and at the same time to shut off all light except from the spot under treatment.

## IN THE COLORS AND SOUNDS OF NATURE.

BY WM. GEO. OPPENHEIM, PH.D., L.B.

A man may prophecy
With a near aim of the main chance of things
As yet not come to life, which in their seeds
And weak beginnings, lie intreasured.

—SHAKESPEARE.

Sounds which address the ear are lost and die
In one short hour, but that which strikes the eye
Dwells long within the mind, the faithful sight
Engraves the knowledge with a beam of light.

—HORACE (*Ars Poetica*).

PHOTOGRAPHY in the colors of Nature! What a fascinating study it has been to many of us who have been searching for the hidden sesame which shall open the doors to a new vista leading from the nebulous land of experiment into the region of realized accomplishment.

How many of us have neglected our cycles and turned our backs to the real beauties of nature in order that we might experiment on how to reproduce these real beauties to the delighted senses, by the power, of the yet, to us, undiscovered art.

How we have sat for hours with ice-cold towels twisted around our heads and strong coffee at our elbows, reading up photographic chemistry, or trying to master Mr. R. D. Gray's guarded statements concerning color photography, or Mr. Ives' explanations of his system of heliochromy, or how Kurtz, with half-tone zinc etchings, made it possible to produce colored composites.

We were not, nor are we yet, satisfied with perusing translations of Lippman's "Interference Theory" and its practice, or Becquerel's "Spectrum Method"; even Zenker's

theory of Becquerel's process (enunciated in 1868), though apparently easy to understand in its English dress, satisfied us not; we toiled through Zenker's German polysyllables, waded and wallowed through Seebeck and Poitevin, tried hard to differentiate "homogeneous sheets of silver chloride containing subchloride" from "sheets covered with powder," or from the practice of "mounting the salts on paper."

It was, and is, all very mysterious, very fascinating, and we all hoped, and still hope, for a satisfactory solution—at some time.

Later on we immersed ourselves in Mr. Cary Lea's "Photochloride Theory," and then we believed Dr. Montross' assurance that he had solved the process by "Body Colors," that is, colors produced by partial absorption of the incident light.

And still later we looked up to, admired and envied Otto Wiener, who insists that heliochromy is all wrong, and that it is quite possible to produce—and that he has produced—natural colors by *direct* influence of light upon certain chemical substances.

Can this be true? If so, Mr. Otto Wiener has solved the problem which has been agitating the photographic world for more than three decades.

What matters it if our puny little experiments made us as miserable as was Sancho Panza after the visit of the enchanted Moors at the village inn? They did not destroy our faith in the ultimate realization of "Photography in the Colors of Nature."

They merely confirmed our belief that science aims at the generalization, while faith seeks the perfection of the individual or the thing; science seeks to know, faith strives to do; science is intellectual, faith ethical.

How the discovery would start the torpid photographic world into effervescence! How it would help us to render nature with the greatest truth and in its most pleasing aspects, to reproduce it with truest truth and fairest beauty

It is, however, in the nature of things, that few of us are, or can be, interested in processes; most of us ask for results.

How many are there in this world who would like to see this great result worked out?

What an impetus it would create throughout the world! How it would change existing conditions and processes!

And when shall it not come to pass?

The inquiry seems idle when it is remembered that the advancement of two generations covers all we call modern scientific progress.

Why shonld our present modern applications be regarded as a final expression of human ingenuity?

In the fullness of time, and probably as soon as the steam engine shall rank as a discarded invention, there shall be invented a lens that shall receive and record, not alone form and outward semblance, but also colors, shades and tints, and all these shall be transmitted, without the intervention of a negative, direct to the prepared paper (or similar substance) behind it, and lo! the paper shall bear upon it the vraisemblance in all things of the object photographed.

And to this delicately adjusted eye shall be attached an all-hearing and recording ear, which shall be composed of a graphophone and microphone, perfected far beyond our present conceptions of these instruments, and altogether they will work, in conjunction with an electrical device, or with force propelled by Argon, which by that time, may have superseded electricity.

In conjunction, simultaneously, or separately, the instrument suggested shall record and preserve and transmit all the colors, shades, tints *and sounds*, and, in addition, sounds and colors which we now but dream of and hope for.

We believe that there are sounds and colors which the human eye and ear with our present appliances cannot perceive or apprehend.

This instrument, yet to be discovered, shall reproduce them.

You say this is impossible! or fanciful!

I say nay, neither one nor the other.

Then, improbable. Granted!

Nothing is impossible in an age in which the impossibili-

ties of one day become far-reaching and epoch-making accomplished facts of the next.

A remarkable instance of imagination being able to overstep the bounds of the possible, or of reality being obliged to follow fiction is afforded by the discovery of "helium." One might imagine that when Professor Ramsay discovered a new element in the air he was beyond the reach of the novelist. Not a bit of it; Edgar Allen Poe had been before him, or if we put it in the other way, when Edgar Allen Poe thought he was inventing an impossible new gas, which should enable Hans Pfaall to float his balloon, he was merely roughly sketching out, in advance, the work to be done in a London laboratory.*

When this shall have come to pass, how warmly alive to our senses will then become the beautiful world around us; how wilderness, foliage, flowers, ocean, air and sky, the upper and under world will then live for us with renewed interest and with a fixed tone and color value.

We would then ride, in fancy, on the edge of every tinted cloud that floats its crimson pennons straight into the depths of the empyrean; all, all will be by the magic art yet to be discovered, and, in a twinkling of an eye, within the photographer's kingdom.

When shall it come to pass? When? And what man shall place himself on the pinnacle of fame in the doing of it?

Who shall accomplish it? How shall it be done?

Ah! How did Bessemer do it? How Raleigh? How Edison? How Ramsay?

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* One of Plato's disciples, anticipating Munchausen, compared his master's thoughts to words frozen in the air as soon as uttered, to be heard long after when thawed out by a warmer season, as voices falling out of the air upon astonished travelers.

In "Hood's Comic Annual," for 1839, we find the following adumbration of the phonograph:

"In this century of inventions, when the self-acting drawing paper has been discovered for copying visible objects, who knows but that a future Niepce or Daguerre, or Hersehel, or Fox-Talbot may find out some sort of Boswellish writing-paper to repeat whatever it hears."

Similarly, about a quarter of a century before the invention of the telephone and the phonograph, the editors of the "Artisan" reported the meetings of their "club" by means of an imaginary "Reporting Box," which was always placed on a table and faithfully reproduced all that was said by the distinguished members.

The secret of the rose's sweetness, of the bird's ecstacy, of the sunset's glory, these are the secrets of genius.

> "The thoughts of men are widened
> With the process of the suns."

What will it do?

No bird shall sing but it will reproduce its notes, its plumage; no thunder shall roar but that it will reproduce its dread echoes and show the accompanying lightning flashes that zigzag athwart the heavens; no sunbeams shall burn, nor stars gleam, nor rainbow glow, but that it shall reproduce their color, their most delicate tints, their form.

Then, indeed, we may listen, though far away, to the hum of the insect, to the roar of the lion, and see their brilliant coloring.

Then the thousand sounds that go to make the solitude; the voices of the rivers that rush to the seas; the babbling of the brook as it hurries to the river, shall charm the listening ear, while the eye shall gloat on their beauties; then shall we reproduce the sounds and the colors of the storms that tear all nature to pieces, the zephyrs that fan fluttering butterflies, the shriek of the hurricane that seems to wreck the corner-stones of the world; and with their sounds shall come to us, their colors, their shadows.

If the accounts of naturalists, from White of Selborne, to Sir John Lubbock, are true, only in part, then human eye hath not foreseen, neither has it entered into the mind of man to conceive, the revelations which the mighty combinations we have imagined shall show to our awestruck senses.

Then, indeed, we may say:

> "Blest be the art that can immortalize
> The art that baffles Time's tyrannic claim
> To quench it."

## AN ALL-AROUND VIGNETTE.

BY W. S. WATERBURY.

I WANT to swing my hat this year in favor of what I consider an indispensable adjunct to the amateur dark-room, viz.: a good, handy vignetter, one that is adapted to all kinds of work, and thus save the annoyance of making a new one for each particular picture.

My purpose is to substitute ground glass for the tissue paper and cardboard of old, and it is accomplished in this way:

First, nail a strip of wood, about a half-inch square, around the outside of the face of the printing frame, carefully mitreing the corners in order to exclude light; this arrangement for landscape vignettes, while for portraits it can be beveled from the one-half inch height on one end of the frame to the frame itself at the other end, as shown by the cut.




This admits of the vignette being more sharply defined at one end, while the other end is softened to a much greater degree.

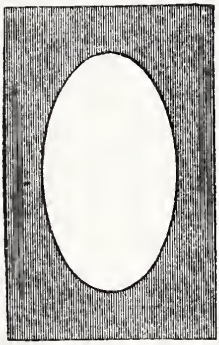
The first arrangement, however, can also be used for portraits with good effects.

Now cut a piece of ground-glass one-quarter of an inch smaller all around than the outside of the frame, and secure it to the strips by eight "L" shaped screw hooks, two on each side, which are screwed down so as to tightly clamp the glass to the strips; this permits the glass to be removed very readily and thus in no wise interferes with the integrity of the frames for other uses.

In securing the glass have the *ground* side *up permost.*

Now on this side paint with thick asphaltum varnish around the edges, leaving an elliptical space in the middle of

the glass untouched, this space to be in about the proportions of the following cut :



The size, however, should be governed by the class of work to be done.

Now there is only an elliptical space on the glass that is clear, and it is in this that the vignette is to be adapted to the view.

To do this, trace with a lead pencil an approximate outline of the view, and then paint from this line to the asphaltum margin with "Guyon's opaque," and, after a the vignette is properly shaped, the edges may be softened by "dabbing" with the end of the moistened finger, and an exquisite softness produced which would be much more difficult to secure with the old arrangement.

The painting of the edges with asphaltum is simply to reduce the amount of surface which otherwise would have to be covered with opaque each time.

By having a glass for each frame, artistic effects can be rapidly produced.

## FIGURE STUDIES BY PHOTOGRAPHY.

BY HECTOR MACLEAN, F.R.P.S., ETC.

VERY considerable prominence has during the past year been given by writers upon pictorial fine art—notably by Mrs. Gleeson White and by Mr. George Moore—to the great value which photographic studies of the figure are to the fraternity of painters, illustrators and decorative designers.

Not only do art critics and art teachers advocate this utilization of photography, but a good many artists openly testify, not only by their work, but emphatically by their works, how valuable they find photographs in enabling them to depict with due naturalism the human form.

There have hence sprung up quite a number of different series of undraped or partially draped photographs of men, women and children, which are supplied in shoals to artists through the medium of agents—such as Erdmann and Schautz—who make a specialty of dealing in such studies. Without stopping to enumerate the various series, I may mention as an example of the last known kind of work at present obtainable Von Gloeden's tolerably popular art studies of the nude. Such others as exist are as a rule rather more frank, but much less gracious than the above.

Having had occasion to carefully examine many representative collections of such artists' studies of the above category as are at present upon the market, I cannot but conclude that nearly all fall short in providing that which artists require, and which the camera is well able to supply. Without doubt there is a splendid field open to those who care to bestow intelligent effort to supply photographic information to that ever-increasing multitude of art students who, unable to flourish without definite and extensive knowledge of the aspects of the human frame, are, for reasons not to be here dwelt upon, unable to command constant and direct reference to living models. I therefore venture to proffer photographers—more especially those who live in the United States—some few words of counsel which I

trust may be helpful to them in meeting a demand which not only exists, but which seems likely to grow in volume. I need hardly explain that within the much restricted limits of this contribution I may not hope to do more than touch the fringe of the subject.

Firstly, I would advise that in all cases information rather than picturesqueness should be aimed at. By which I mean that such, more or less, attractive pastures and arrangements as Von Gloeden is so fond of should be absolutely eschewed. Art students do not paint life-studies as part and parcel of an elaborate composition teeming with accessories and rejoicing in a strongly accentuated background; on the contrary, in such cases they go for hard facts.

Much the same objection exists against violent or sensational effects of light and shade; such are not wanted. Remember, it is the gray day which the landscape painter mostly prefers; a day when effects are absent, but when, on the other hand, texture in form, local color and outline are definite and distinct. Similarly the figure painter wants, not dramatic impressions, but details in plenty.

Of course, mere flatness is not desirable; on the contrary, careful and skillful lighting, which the properly trained operator knows so well how to obtain, is imperatively called for. The whole subject should be depicted in finely graduated half-tone, relieved by a few touches of high light and strengthened by trenchant shadows.

Above all, let there be no retouching. By employing a so-called orthrochromatic plate—say one sensitive to yellow and green, as well as to purple or blue—there will be little need and less inducement to meddle with the negative.

From what has gone before it will be gathered that a rigidly plain background should be employed, so that there shall be nothing in the print to distract the artist's eye from the model—nothing which is calculated to modify or alter the values of the modulations and contours of the figures.

It is of course needless to insist that the tone of the background shall be such that both the half-tones and shadows stand out with due distinctness.

Those who meditate attempting to produce acceptable

artists' studies should, as a rule, not merely be artists by training, but should be well in touch with a circle of painters. The haphazard photography by ignorant operators of undraped men or women is mere futility.

Whether he be a trained artist or not, it is, in any case, a *sine qua non* that the photographer has an abnormally keen perception of what is art worthy. He should, at a glance, discriminate between that which is good and that which is ignoble, and should be capable of accentuating the one while, on the other hand, able to suppress the other.

The task is a hard one; for even more or less eminent painters at times blunder, and elect a semi-deformity to the throne of Beauty.

Much may be learned by judicious reading. Take, for instance, such a book as "The Human Figure," by Professor Brücke, of which an excellent translation by Professor Anderson, of the Royal Academy of Arts, London, has been published. In the foreigner's book will be found shortly but definitely laid down, what are the chief points of perfection which should be present in an ideal well-formed human figure.

In addition to many useful matters of information to be found in the above and similar works, the photographer will assuredly be impressed with the conclusion that the camera will be best employed in recording carefully chosen portions of the human anatomy rather than in presenting the entire figure.

For no person exists all of whose parts approach a moderate pitch of perfection; indeed, it but rarely happens that an individual has more than one single bodily feature which is fit to be taken as a pattern of the "should be."

It is a well-established fact that even where one has possessed several ideally perfect parts, that these have not all been at their best at an identical period of life. For instance, it not infrequently happens that when the main portion of a woman's figure is, on account of age, no longer suitable to paint from, the hand and arm have developed into a state of comeliness and grace that they did not attain to when the torso was still in its prime.




C. L. Wright & Co., Engs.

FLOWER STUDY.

By W. A. FRASER.

There are, I feel sure, both credit and cash to be earned by the photographer who will produce a series of carefully selected and well rendered salient portions of the human figure, particularly if these are published upon a tolerably large scale, say 15 x 12.

Given an arm which approximates to perfection of shape, one might make of it alone a good score, if not more, of telling and valuable art studies. As for hands, there should be a fortune in them; their varieties due to sex, age, health, character, vocation, etc., are almost infinite ; while both in arrangement of lines and of shadows, and also in expression of emotions and sentiments, there is scope almost unlimited.

In a similar fashion, in their respective degrees, will all parts of the body be found to yield precious indications of the ideal nude.

My remarks have been entirely directed to the obtaining of such studies as are likely to be helpful in the delineation of the perfect type of humanity. Outside this there exists a perhaps even larger field of action in securing special types; not merely racial, but indicative of various phases of temperament, intelligence, morality, habit, and other characteristic deviations from the normal which are stamped upon the body of the individual.



YE OLD TIME COTTAGE. BY R. A. WADSWORTH.

## A "WRINKLE."

BY VAL. STARNES.

DIFFERING from the standard authorities in regard to several points of Whist strategy, I recently put my ideas into type-written manuscript for the benefit of a few friends, illustrating the same with fac-simile diagrams of playing cards that I obtained by means of my camera.

Pasting an ordinary pack of cheap cards to a drawing board—Spades and Clubs together at the top, Hearts and Diamonds below—I reduced them to the desired size and made a 5 x 7-inch negative of the whole.

As each print was removed from the frame I clipped it carefully in half with a pair of scissors, thus separating the Spades and Clubs from the Hearts and Diamonds, and then gave the former a black tone in a combined bath, while the



latter were simply "fixed" without toning, which left them of a reddish-orange hue.

When each slip was washed I rubbed it down on a ferrotype plate, and as it dried coated the back with glue. When completely dry I stripped them and clipped each little card apart.

I was then enabled to put in an exact fac-simile of any playing card—black if a Spade or Club, reddish if a Heart or Diamond—in whatever part of my manuscript called therefor, with the same ease and rapidity that you would attach a postage stamp to an envelope, as the reproduction needed only to be touched to a sponge, or the tongue, and then pressed down on the paper, in any position, or to any number, that I pleased.

I do not suppose many readers of THE ANNUAL will be wanting to illustrate manuscripts on the subject of Whist, but the above suggestions can be applied with advantage to any illustrations that require to be repeated frequently, and to that end I offer them.

## EVENING PRINTS.

BY FREDERICK A. JACKSON.

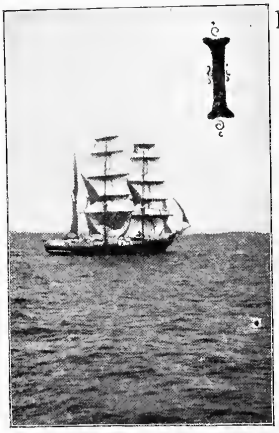


By Morrison, Chicago.

IF A very brief exposure is given with a rapid lens—say of the portrait form, working at *f*/4—beyond a circle representing the diameter of the lens aperture, the falling off of illumination is quite marked; so great in many cases that only the centre of the negative can be made of any service. To remedy this defect proceed as follows: Having placed a piece of bromide paper over such a negative in the printing frame, expose it to the light of a lamp or candle, between which and the negative a piece of ground glass has been interposed. Let the flame be as close as possible to the glass and placed centrally. Do not use too strong a light, and let its greatest strength fall upon the middle of the negative, gradually diminishing as does the density of the negative. In this way a uniform print will be secured. Of course the method will not supply any lack of sharpness, but it will certainly even the tone. The bromide, after development and fixing, can be tacked upon a board while wet and a new negative taken that will give satisfactory prints on other than bromide paper.

## A FOLDING LENS HOOD.

BY GEO. G. BRUCE.



Louis Kurr.

IF YOU require a handy lens hood, and one that can be used for any view work, it can be made as follows: Have a small bellows, made square, the size to depend on the size of the lens you use. The end piece of bellows that fits the lens should be made of soft pine, and fit the lens snugly in place of the cap.

The front end of bellows to be a light iron wire frame. To make the bellows rigid when in use, take pieces of brass about the sixteenth of one inch thick, and a half-inch wide, their length to be one-half or one-third the length of bellows when extended; fasten them at the ends with small rivets, and then fasten to the ends of bellows on the top and bottom. The bellows can be made cone shape, but it will require greater skill in making them.



POVERTY POINT. BY HARRY AND MARIE PLATT.



The Art Engraving Co.

CHILD STUDY.
BY L. M. McCORMICK.

## A NEW PHOTO-MICROGRAPHIC CAMERA.

BY W. H. WALMSLEY.



Rosaline, J. C. Carpenter.

FEW WILL deny that the importance of photography as applied to the microscope has long since been conceded, and at the present time very few microscopists fail to avail themselves of its aid in illustrating and recording the results of their observations. In the lecture-room, photographs thus made are used in illustration of all subjects treated therein by projection with an optical lantern upon a screen. In a vast number of cases a whole class may thus follow the lecturer in the illustration of his subject, and see at once and altogether, what each student would, under other circumstances, be obliged to study by himself under the tube of an individual microscope. A great saving in time, with more satisfactory results, is frequently gained by this method of teaching, which is rapidly becoming universal in all grades of schools and colleges, and in illustrating every branch of scientific research. Hence, it follows that any improvement in the camera tending to increase its scope of usefulness, without unnecessary complications or costliness, is a material aid to the busy worker.

Almost any camera *may* be pressed into the service of the microscopist, and, by the aid of a little ingenuity, made to do good work. There is no doubt of that. But it is vastly




THE GYPSY.
BY A. MORENO.

Helleberg Photo Engraving Co.

better in all respects to use one made especially for the purpose; and if in time the latter can be adapted to other uses so much the better. The forms hitherto placed upon the market by various makers, American and foreign, nearly all required the microscope to be used in either a vertical or horizontal position—usually the latter. Both forms are, however, equally useful to the photo-microscopist. For all objects in fluid he must use his instrument in the upright or

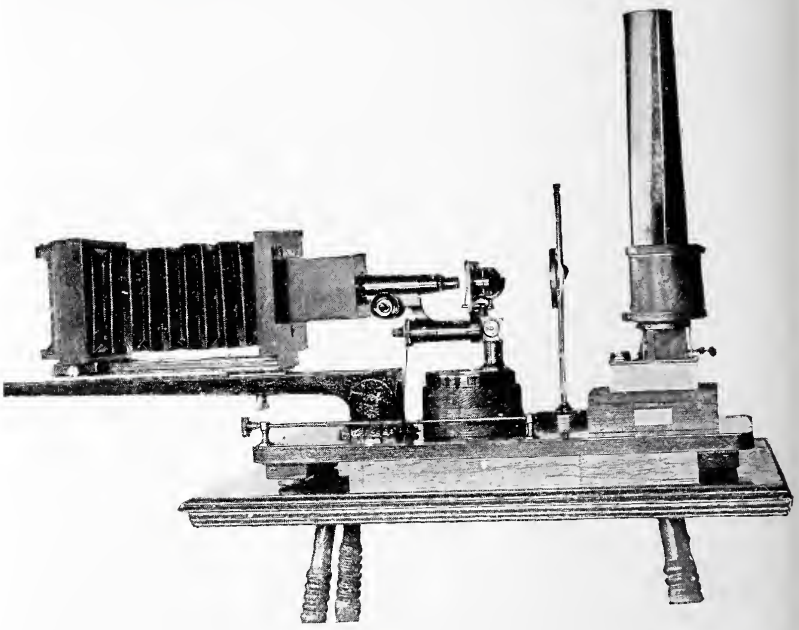


FIG. 1, SHOWING CAMERA IN A HORIZONTAL POSITION.

vertical position, but under most circumstances, and especially where direct day or lamplight is to used, the horizontal is vastly better and more convenient; while an inclination of about 45 deg. is the best of all in photographing an opaque object. A brief description of a camera which I have recently perfected may not be uninteresting to the readers of THE ANNUAL.

The base of the "Autograph" camera is a solid platform



Albany Engraving Co.

ON THE MIAMI.
BY J. C. CARPENTER.

of mahogany or other heavy wood, standing on three short supports to insure steadiness upon any surface, and weighted beneath the front end, the purpose of which will be explained farther on. To the other end of the platform is attached a firm iron frame, two feet or more in length, having a joint at the base, whereby it can be placed in vertical or horizontal

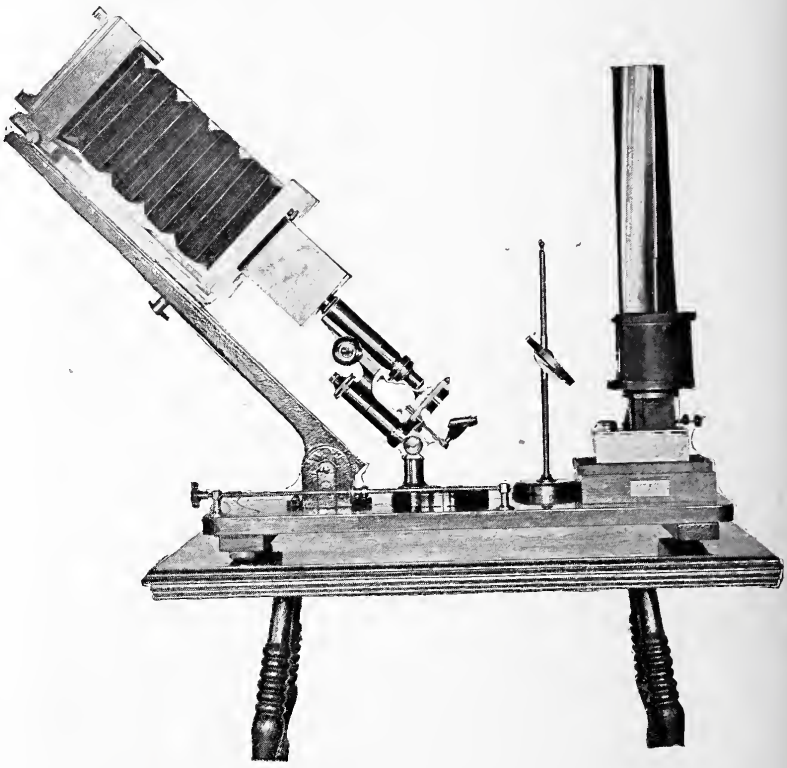


FIG. 2, SHOWING CAMERA IN AN INCLINED POSITION.

positions, or inclined at an angle of 45 deg., and firmly clamped in either one of them. The camera box itself, slides upon two grooves milled in the upper surface of this frame, and may be securely fastened at any desired point by the turning of a conveniently placed screw. The camera is pro-



Art Photo-Etching Co.

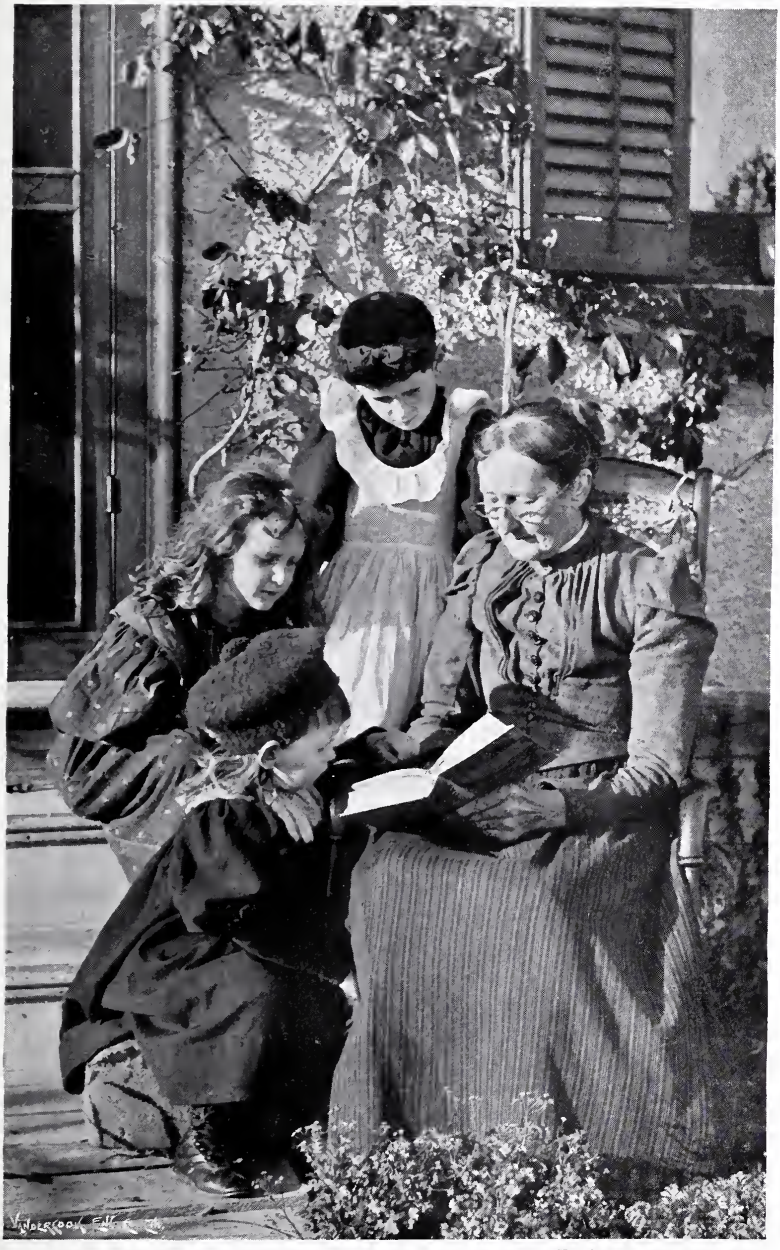
"GOODBYE."
BY H. K. NOYES.

vided with leather bellows, having an extension usually of twelve inches, though double that length may be used if desired. The back (carrying focusing screen and plate-holder), is reversible, a valuable feature in placing an object properly on the plate, where the microscope is unprovided with a rotating stage. The focusing screen is held in place by a turnbuckle, and can be replaced by a sheet of plate-glass for final focusing, the ground glass being used only for centreing the light and arranging the object properly in the field of view. The plate-holder, which is double, has thus far been made to carry 4 x 5 plates for its largest capacity only, but it is provided with kits for use with 3¼ x 4¼ and 2½ x 2½ inch plates as well. Should larger plates be required a box of same construction, to carry 6½ x 8½ or even 8/10 plates may be fitted to the carrying frame.

The front of the camera box has a vertical shifting arrangement, and is fitted with two removable front boards, a plain one to which a flange may be attached for carrying an ordinary photographic lens, and one fitted with an extension box or cone with opening to receive the tube of the microscope.

When the instrument is used in either the vertical or inclined positions, the coarse and fine adjustments of the microscope may be readily reached and manipulated. But when employed horizontally, the distance is too great to readily reach these adjustments and see the image on the focusing-screen at the same time. A rod having a large milled head upon one end, and an adjustable pulley-wheel at the other, is therefore, attached to the base-board in such manner that a cord passing around the pulley and micrometer screw of the microscope readily turns the latter when the milled head is manipulated.

The base, or platform, uponw hich the camera is mounted, is sufficiently long to hold, in addition, the microscope, lamp and a condensing lens on stand. The front portion is weighted beneath in order to steady the entire outfit when the camera is extended on the frame at the rear. The whole apparatus is extremely portable and can readily stand upon an ordinary work-table without interfering with other articles thereon.



Vandercook Engraving Co.

AN INTERESTING STORY.
BY C. H. LIKENS.

The usefulness of the "Autograph" camera is by no means confined to microscopical work. It is equally well adapted to copying, and the making of lantern-slides by reduction or enlargement; while mounted on an ordinary tripod it makes an efficient view camera. For copying it is used in the inclined position, with a photographic lens mounted either on the plain front or the projecting one. A frame, inclined at right angles to the camera, is placed upon the base-board, and serves to hold the book or picture to be copied. The details necessary for this work are familiar to every photographer. In making a lantern-slide by reduction or enlargement, the negative is placed on the same stand, with a sheet of white paper on the base behind to reflect the light. A focusing cloth is then to be thrown over the space between the camera and the negative, to exclude all light save that passing through the latter. The camera is then to be moved to or fro until the proper sized image is formed on the ground glass of the focusing screen and a sharp focus obtained by manipulating the bellows in the usual manner.



CRYSTALLIZED SODA IN THE BOTTOM OF A BOTTLE.
BY H. F. PRESTON.

# WATER FROM A PHOTOGRAPHER'S POINT OF VIEW.

BY PROF. C. H. BOTHAMLEY.



Little Alice Corner. By Morrison, Chicago.

PHOTOGRAPHERS are all more or less familiar with the terms "hard" and "soft" water, though those who are fortunate enough to live in towns which are supplied with comparatively soft water have little practical experience of the inconvenience and disadvantages that arise when the only readily available supply is very hard water.

Photographers who are also chemists know, of course, what the effect of hard water is likely to be in most of the processes of photography, but there are many good photographers who would scarcely claim to have a knowledge of chemistry, and for them it may be useful if the main points are summarized.

Water is "hard" when it contains any considerable proportion of calcium or magnesium compounds dissolved in it. The particular salts most commonly present (derived from

the rocks through which the water has traveled) are the carbonate, sulphate and chloride of calcium, and the carbonate, sulphate and chloride of magnesium. All these compounds do not however behave in exactly the same way. The sulphates and chlorides, whether of calcium or magnesium, are kept in solution by the solvent action of the water itself, and therefore, if the water is boiled, without being allowed to boil away or evaporate, the calcium or magnesium salts are not precipitated, but remain in solution, and the water is just as hard after boiling as it was before. Such waters are said to be "permanently" hard, and their hardness is spoken of as "permanent hardness."

Calcium carbonate and magnesium carbonate, on the other hand, are very slightly soluble in pure water, and only dissolve to any marked extent when the water also contains carbonic acid dissolved in it, as many natural waters do. If waters of this kind are boiled the carbonic acid is expelled in the form of carbonic acid gas (carbon dioxide), and as a consequence the calcium or magnesium carbonate is precipitated or thrown out of solution. If the precipitate is allowed to settle, or is filtered off, the clear liquid now contains very little calcium or magnesium carbonate, and is consequently much softer than it was before. Such water is said to be "temporarily" hard, because the hardness is to a large extent removed by merely boiling the water, and the hardness is called "temporary hardness."

This distinction is important even in ordinary operations, and becomes still more important when the question of softening the water on a large scale is under consideration.

It is necessary to bear in mind, however, that natural waters may well contain carbonates and sulphates or chlorides at the same time, and in these cases, of course, part of the hardness will be "temporary" and part will be "permanent."

The influence of the calcium and magnesium salts in photographic operations depend mainly on the fact that both bases, and more especially calcium, have a tendency to form compounds that are insoluble in water. We have also to take into account the fact that calcium and magnesium carbonates are feebly alkaline substances and have the power



JAPANESE GIRL

By W. K. BURTON.

Bridgeport Engraving Co.

of neutralizing acids, and we must not forget that these carbonates have the power of precipitating iron and silver and mercury salts, and that the chlorides will precipitatesilver salts; these latter effects being, however, due to thefact that they are carbonates and chlorides respectively, and not to the fact that they are calcium and magnesium compounds.

Coming now to particulars the first question is, naturally, What will be the effect of hard waters if used for making up developing solutions? In the case of pyro, quinol, and similar developers, the only evil effect that can arise is due to the slight alkalinity of calcium or magnesium carbonate if present, and this difficulty is easily got over by the usual practice of slightly acidifying the solution with the alkaline constituent of the developer; on the other hand, there will usually be a precipitate if the hardness of the water is at all pronounced, but this precipitate can be filtered off or allowed to subside. Perhaps the most important point in this connection is that a slight precipitate of calcium or magnesium carbonate may form in the film during washing between developing and fixing, but it is not likely to interfere in any way with the printing qualities of the negative. When ammonia is the alkali used, the tendency to form a precipitate is very slight unless the water is highly charged with carbonates.

With the ferrous oxalate developer the effects may be much more marked. If carbonates are present there is a tendency to precipitate the iron in the form of carbonate, but this can be easily avoided by acidifying with dilute sulphuric acid. Calcium salts in any form will cause a precipitate with potassium oxalate, and the remedy is either to filter the liquid or allow the precipitate to subside and pour off the clear liquid. Magnesium salts are much less likely to produce a precipitate, especially in presence of such large proportions of potassium oxalate as are commonly used.

If the water contains a considerable quantity of calcium salts, there will probably be precipitation of calcium oxalate in the film during washing between developing and fixing, and this slight precipitate, though not appreciably injurious in the case of a negative, may be a distinct drawback in the

case of a lantern slide, for the preparation of which ferrous oxalate is now most frequently used. One way out of the difficulty is, of course, to use soft water for the washing; another equally good is to rinse the plate two or three times in slightly acidified water, which has the advantage of producing the risk of precipitation of basic non-salts. Of course the acid must be carefully washed out by means of ordinary water before putting the plate into the fixing bath.

In fixing, the presence of calcium and magnesium salts has no injurious effects.

During washing, after fixing, the hard water is likewise harmless, but since the amount of saline matter dissolved in it is considerable, there is a probability of a slight veil being left all over the negative after drying. It is, therefore, the best plan to rinse the negative two or three times in rain water or distilled water after it has been well washed in the hard water.

So far as the toning and fixing of prints is concerned, there is no evidence to connect any injurious effects with the use of hard water. It has been stated to aid the production of yellow stains, but this is pure assumption, with no evidence to support it, and it has also been asserted that the use of hard water increases the tendency to double tones, but here again there is an absence of any evidence.

It is, however, very desirable that rain water or distilled water should be used for the last two or three washings of the prints, in order to wash out the hard water, and thus prevent the formation of any slight veil such as has been alluded to in the case of negatives.

## ENLARGEMENT OF NEGATIVES BY EXTENSION OF THE GELATINE FILM.

BY CHARLES SCOLIK.

OWING to the very unfavorable location of my studio I can light my subjects only from one side, and the result is that all of my portraits face the left.

Occasionally a picture was required in which the face should be turned the other way, which was not easy to

accomplish under the conditions. I tried reversing the position of the negative in the holder, *i.e.*, exposing through the glass, of course in such a case everything in the picture was reversed, and this method could only be followed where the attire and coiffure were not such as to make the reversal too evident. For instance, the row of buttons would appear on the left side, and the breast pocket of a coat on the right hand. Beside these objectionable features there were others, viz.: the glass plate had to be cleaned most carefully, and in focusing an allowance had to be made because of the thickness of the glass. On the whole it was an unsatisfactory procedure.

I soon abandoned this method, however, and now when a reversed negative is desirable or necessary, I much prefer to strip the film from the plate and transfer it to another, the other side toward the glass. For some time I have performed these operations so often that I have become quite expert, and while others might venture upon the experiment with fear and trembling, I do not hesitate to use this method of obtaining the desired end, with the most valuable negatives. My practice in this direction has often been of value to me. For instance, I made several instantaneous exposures on 10 x 12 plates during the funeral of Archduke Albert. These turned out quite well, notwithstanding the fact that the weather was dull, and that I was obliged to expose through the soiled glass of a window which could not be opened. As I was obliged to work without stopping down, the central portions only of the negatives were sharp. I developed the plates until they acquired considerable density, and transferred the films, at the same time enlarging by extending them, and in this way obtained sharp pictures, $7\frac{1}{4} \times 9\frac{1}{2}$, in which the figures were about seven-eighths inch high. I have enlarged by the same means many hand-camera negatives. The process is very simple. The film of negative, when dry, and naturally unvarnished, is first cut through to the glass by running a sharp knife around it a little ways from the edge of the plates. The negative is then placed in a weak muriatic acid bath, 1 part commercial acid to 50 parts of water. The film very

soon separates from the glass, and the operation is carefully helped along with the fingers. In case the film adheres strongly at a certain place, care should be taken not to attempt to loosen it by pulling the film, but the latter should be pushed along carefully from the opposite edges of the plate, in order not to tear it. When entirely separated a larger plate is pushed under the now floating film, which has expanded to a considerable degree, remembering to reverse the film if that is the object in view. The plate and film are now lifted carefully out and thoroughly washed under a penstock to remove all traces of acid. Under this treatment with cold water, the film expands in a notable degree, so that, for example, a negative of $4\frac{1}{4} \times 7$ can be enlarged to 8 x 10.

If so great an enlargement is not desired, the washing is omitted. If it is preferred that there shall be no appreciable enlargement, the glass plate and transferred film are placed in a mixture of equal parts of water and alcohol, in which the film is restored nearly to its original dimensions. Naturally the development must be carried further, as regards density, the greater the subsequent enlargement is to be. To remove the air-bubbles under the transferred film, a piece of the filter-paper may be placed over the latter, and a rubber roller passed over it carefully. Care should be taken to cut the paper slightly smaller than the gelatine film; the smoothest paper obtainable, and without loose fibres, should be used for this purpose. The plate should now be dried horizontally in a damp place, as if dried too rapidly the film will leave the plate. I urgently recommend others to familiarize themselves with this almost unknown and unused process, as opportunities to employ it so frequently offer themselves. For instance, I make most outdoor exposures on small plates, and on my return home enlarge them by the before-described method. Another advantage is that several negatives may be combined; for instance, not long since I had to make a group of over 150 persons; pictures 20 x 24 were called for, while I had a camera using only 12 x 16 plates. I placed the group, and then took first one half and then the other, took the plates home

and developed them, then cut through the films with a sharp knife at points exactly corresponding, stripped the films, and transferred them to a larger plate, brought the edges together carefully and, with a little retouching, had a negative in which it was hardly noticeable that it was in two pieces. In the same manner, a head may be placed on another bust in portraits; landscapes may be combined and even panoramic negatives secured. Of course, negatives intended for these purposes must possess, as near as may be, the same density. If the films adhere strongly to the glass, the muriatic acid bath may be replaced by fluoric acid 1:40. If the transferred films need intensifying, in order to prevent the detachment of the film in the intensifying solutions, the edges of the negative should be secured with negative varnish.

## A SIMPLIFIED APPARATUS FOR PHOTO-MICROGRAPHY.

BY PROF. A. B. AUBERT.

THE above instrument, devised and manufactured by Mr. F. Lemardeley, of Paris, is, I think, worthy of the notice of those of the readers of the ANNUAL who are especially interested in low or medium power photomicrography. Its price, which is only $7.50 in France, is certainly moderate enough.

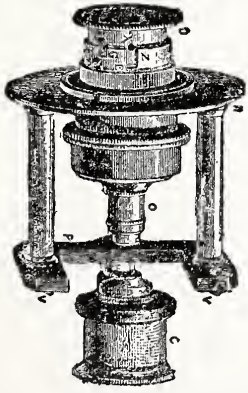


FIG. 1.

It consists essentially of a stage, P, supported by two metal columns. Two spring clips are shown at V V. At O we have a dividing objective which may be focused by means of a micrometer screw. D is a diagram which cuts off the outer portions of the field. C is a condenser.

The little apparatus can readily be attached to any camera by means of the metal collar. The source of light may be of any nature; a good kerosene lamp will be found convenient and quite sufficient for low and medium powers. The spring clips being on the underside of the stage the objects will always be in the same plane and there will be no need



FIG. 2.

of change of focus in passing from one preparation to another. The objective furnished with the apparatus has magnifying powers of 7 and 15 diameters, which can, of course, be increased by drawing out the camera.

For the above powers, the apparatus is furnished with automatic adjustments. The tube bearing the objective slips into a tube having two notches of varying depths, while it has an arrest or button which may be made to slip into either notch, thus securing an accurate focusing for the two powers of the objective. (See X and Z in Fig. 1.)

Other objectives may be substituted for the one furnished with the apparatus.

## FERROTYPING.

BY J. R. SWAIN.

THIS article is contributed by special request for the ANNUAL. I do not know that I can say anything that will be new, especially to the older members of the craft, but if I can say anything that will benefit some new member, struggling with the intricacies of this neglected art, I shall be amply paid.

Ferrotypes are generally made in groups of four on 5 x 7 plates, with 4¼ Darlot gem lenses. The lenses are quick acting.

Very few regular galleries make ferrotypes at the present time. Still there is more profit in making them than in making photographs. They are now mostly made by traveling artists and at the county fairs.

### THE SILVER BATH.

The silver bath is made by dissolving pure nitrate of silver in rain or ice water till it is 45 grains strong. Use a hydrometer to get the strength. Sun till clear; filter, then add pure nitric acid, a few drops at a time, till it turns blue litmus paper slightly red—better add too much than too little. Now pour it into the bath-tub and coat the largest size plate you are using with collodion; immerse it in the bath for an hour or so, and it is ready for use. Any size bath can be made in this way, but the larger the bath the better it is, and the longer it will work. Not less than a half gallon should be made at a time—better a gallon.

Such a bath improves with age, and can be used till the strength is reduced to 35, and sometimes even as low as 30 grains. The bath should never be filtered or doctored in any way while in use. When the bath becomes too weak, or fails to work from some other cause, it should be placed in a porcelain-lined evaporating dish and evaporated to dryness. The heat should be continued till all foaming and smoking cease. In this way all the alcohol, ether and dirt, carried into the bath by immersing the plates, are removed. The pure silver will settle in the bottom of the dish, and when cold can be easily redissolved. Now add rain water to make

the original amount, and silver to make 45 grains strong. Sun till clear, filter, and add nitric acid again till it turns blue litmus paper red, and it will work as well or better than a new bath.

COLLODION.

| | |
|---|---|
| Alcohol (Atwood's) | 5 ounces |
| Sulphuric ether | 5 ounces |
| Iodide of ammonium | 40 grains |
| Iodide of cadmium | 20 grains |
| Bromide of cadmium | 20 grains |
| Gum cotton | 40 grains |

This works best when about a week old. It keeps well.

DEVELOPER.

| | |
|---|---|
| Water | 64 ounces |
| Sulphate of potassium | 1 ounce |
| Protosulphate of iron | 1½ ounces |
| Iron and ammonia | 2 ounces |

Dissolve, filter, then add 3½ ounces of acetic acid.

This is a very good developer. It works slow and gives fine details.

FIXING BATH.

| | |
|---|---|
| Cyanide of potassium | 4 drachms |
| Water | 16 ounces |

Cyanide of potassium is very poisonous, and must be handled with great care. It is best to use the fixing bath in a bath tub, the same as the silver bath, keeping it well covered to prevent the fumes from escaping.

VARNISH.

| | |
|---|---|
| Gasoline, 74 deg | 20 ounces |
| Sulphuric ether | 4 ounces |
| Gum dammar, finely pulverized | 2 ounces |

GENERAL REMARKS.

It is best to keep two silver baths on hand at all times, one in use while the other is being renovated.

Bend the prongs of the rubber dipper by heating them over a lamp so that the plate can be immersed in the bath collodion side down. It prevents dust and dirt from settling on the face. Use a cometless collodion vial to flow the plate with collodion.

It is not in good taste to tint the cheeks.

Remember it requires double the amount of light to make ferrotypes that it does to make negatives.

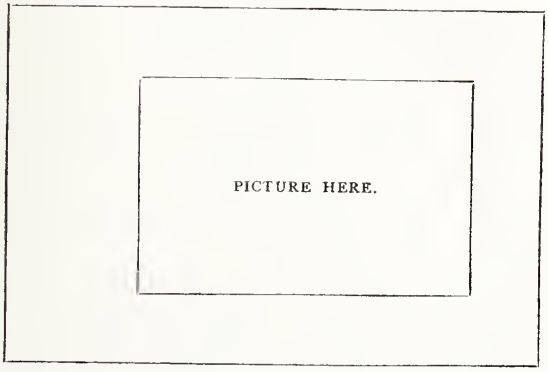
# HOW TO SAVE AND KEEP PRINTS IN A SYSTEMATIC MANNER.

BY DAVID GRAY ARCHIBALD.

HOW to save and keep prints in a systematic manner, or in any manner at all, is a question that is constantly arising in the mind of the amateur photographer. He takes many good plates, but when called upon to show prints from them is unable to do so. They have been lost, destroyed, or given to admiring friends.

I would like to call attention to a way of keeping a collection of prints, which I have used and found perfectly satisfactory, especially for those taken upon an outing or during a summer's travel.

It is as follows: I print upon blue paper (platinotype paper might be used if one does not mind the expense), because it has body enough to stand binding, which will be explained further on.




PAGE AFTER TRIMMING.

Observe the liberal margin on tne eft-hand side allowed for binding.

Print as many pages as you have negatives, using cut-outs of different sizes and shapes to get what is best in your negatives, or to vary the look of the pages.

Have printed for you a title-page and a cover with something like the following upon it:

---

RANDOM VIEWS

FROM MY CAMERA.

DAVID ARCHIBALD.

1895.

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If you wish, these can be of blue paper, and lettered by hand. After having your prints all made, trim them, select the best, and arrange in the order in which they were taken; placing before each a page bearing the name of the view and a few words of explanation.

This I typewrite, as shown below.

---

''WEIGHING OUT''

SARATOGA RACE TRACK, N. Y.

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Print your best view with a margin upon the right side instead of the left, to face title-page and serve as a frontispiece.

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A little thing, but one which, like many other little things, makes a great difference in the finished result, is to smooth your prints upon the reverse side, when they are nearly dry, with a moderately hot iron. This will make them lie flat, and add greatly to the appearance of your book.

# THE NEGATIVE OF THE FUTURE; OR, THE NEW CAOUTCHOUC STRIPPING FILM.

BY G. BALAGNY.

IN returning to stripping films, while modifying their preparation on the lines which experience indicates, we do not believe that we are taking a step backward.

A good film is a necessity. People travel more and more, and more and more is a photographic apparatus of some kind the companion of the traveler. Moreover, we have already given too much time to the solution of the problem of a perfect film, not to feel a certain pride in the perfection of the same. In our opinion, based on what we have passed through in perfecting film photography, paper is the only support which is worthy of careful consideration. So far as the sensitiveness is concerned we will be glad to exhibit to unbelievers some negatives made in the *Bois de Boulogne* of horses at a distance of about 32 feet. They show that they were fully exposed notwithstanding the fact that the exposure was very short.

So far as printing without stripping the film we can only say that the grain of the paper is certain to show, even when vaseline has been applied; and, moreover, a very long time is required for printing,

Our preference was for a stripping film, bearing in mind those which we manufactured almost nine years ago and which met with such favor, but there are certain conditions to be fulfilled. The film must be easily stripped from the paper. It must be absolutely unalterable so far as its dimensions are concerned. It must be servicable without transferring to another support, and its thickness must be sufficient to permit prints to be taken from it in an ordinary printing frame.

But for those who are not frightened off by a little extra work, it must be capable of transferring in order that its thickness may be increased when desirable. In short, the film must be such that one can do as he pleases with it.

It is on these lines that the manufacture of these films has been taken up by *Lumiére et Cie.*

No established rule can be given for the exposure. Experience must be the guide.

Any ordinary developer may be used. The only precaution to be observed is to add to the developer 25 to 30 per cent. of alcohol according to the volume of developer used. This is to prevent the film from curling in the developer.

The developer is as follows:

A.

| | |
|---|---|
| Water | 1 litre |
| Sulphite of soda | 125 grammes |
| Hydroquinon | 15 grains |

B.

| | |
|---|---|
| Water | 100 c.c. |
| Caustic potash | 10 grains |

C.

| | |
|---|---|
| Water | 100 grains |
| Brom. potash | 10 grains |

Developer for Instantaneous, Etc.

| | |
|---|---|
| A | 100 c.c. |
| Water | 100 " |
| B | 10 " |
| C | 5 " |

Add 50 c.c. alcohol. The negative is placed in the developer, film downwards. It is kept thus until the alcohol has caused the paper to lie perfectly flat. It may then be turned the other side up and the development completed. For a time exposure the amount of water should be doubled; 10 c.c. of sol. brom. pot. should be used and the caustic pot. added at the rate of 2 c.c. at a time until the image appears, when no more should be added, and the negative should be allowed to acquire its proper density. When developed, the negative is rinsed and placed in a bath of

| | |
|---|---|
| Chrome alum (obligatory) | 50 c.c. |
| Water | 1 litre |

After ten minutes the negative is placed in a fixing solution =

| | |
|---|---|
| Water | 1 litre |
| Hypo | 250 grammes |

Afterwards the negative is well washed in at least six changes of water.

At the expiration of an hour or two the negative is dried, on blotting paper, changing frequently. This gives a flat negative. The film should not be stripped from the paper until the negative is perfectly dry. To strip the film, the paper is dampened with benzine by means of a flannel pad. One corner of the film may be raised with the finger-nail, and by carefully passing between the film and the paper a thin knife-blade the film may be separated completely from the paper. A very thin film is thus obtained, which may be printed from either side. These thin films may be kept in a book or between blotting paper, provided that they be kept perfectly dry, the films not having been coated with collodion, which we consider preferable.

Films should always be collodionized before stripping. The negative may be fastened down at the four corners by means of thumb-tacks, and a coating of collodion (three per cent.) applied with a camel's-hair brush. 2d. While yet wet, excess of water is removed with a blotter, the negative is secured to a glass plate with good starch paste, paper down; it is allowed to dry and afterward flowed with collodion. This is allowed to dry; a knife is run around the negative at a distance of about one-sixteenth of an inch from the edge; when the film is easily detached.

Or, the negative may be placed in a printing frame, film side out, with blotting paper and a glass plate behind it, and then flowed with collodion; when quite dry the film may be detached with benzine and trimmed to the lines formed by the edges of the printing frame; in any case, to obtain a flat negative, it is necessary to apply thick collodion.

In case a more flexible negative is desired, before applying the collodion, while wet, place the negative, for 10 minutes, in a bath composed of

Alcohol (95 per cent.) ..... 500 c.c.
Glycerine ..... 25 c.c.

remove it, and when dry apply the collodion as in the other cases.

The film may be transferred to a gelatine skin if desired.

Place the negative paper down on a glass plate, choose a gelatine skin somewhat larger than the negative but smaller than the glass, soak the skin in a bath composed of

| | |
|---|---|
| Water | 1000 |
| Alcohol | 50 |
| Glycerine | 60 |

after soaking until limp, apply the skin to the film, avoiding air bubbles; pass a squeegee or roller over it.

With mucilage, fasten a strip of paper, about ½-inch, on at least three sides of the negative, half the width on the glass and half on the negative; when dry, cut around the negative with a sharp knife and remove it from the glass plate; the paper can then be detached with benzine, as before.

## A COMMON FAULT.

BY DR. HUGH ERICHSON.

PERHAPS of all the mistakes made by an amateur, and especially by a beginner, is that of under-development, resulting in a weak negative. Sometimes the negatives produced are so weak that even intensification will not improve them much, and all this because they were taken from the developing bath too soon. Amateurs should remember that it is better to have too much density than too little. A negative can always be reduced with satisfactory results, but intensification is rarely satisfactory. Let me admonish my brethren of the camera, therefore, not to take their plates out of the developing solution too soon, but to be sure that they get enough density.

Just so it is with the prints. The average amateur does not print deep enough, and the result is a picture that has a washed-out appearance, that has not enough character, so to speak, to hold up his head, and that, therefore, is consumed with shame and hides itself away in some secret drawer never to see the light again. The amateur may take it out from time to time and sigh that it is not better. Let him go to work and print it deeper and he will not sigh any longer.

## AN IMPROVED PRINTING BATH FOR ALBUMEN PAPER.

BY W. H. SHERMAN.

THE printing bath presently to be described has been evolved step by step in the course of experiments extending back over a period of five or six years. I will not say it has reached the highest point of ideal perfection which may be conceived, but it has reached the highest point of excellence that I have ever had knowledge of.

The deterioration of the silver solution has always been the *bête noir* of the printer of albumen paper, and various have been the remedies and preventives recommended to avert the evil effects consequent therefrom; such as constant sunning when not in use a higher degree of concentration than would be otherwise necessary; boiling down and burning out the organic matter, treating it with kaolin or permanganate of potassium, etc. This deterioration, as is well known, is due to the absorption, by the silver solution, of albumen from the coating of the paper; and, it must be admitted, that a printing bath which will not dissolve any of the albumen and at the same time give results rivaling in beauty anything obtainable by photography, is a desideratum.

This much is practically accomplished. Apparently no albumen is dissolved, for the bath works equally well from first to last. With these recommendations I offer it to those who have time to silver their own paper, and by so doing can save more than half the cost of printing materials:

Dissolve 8 ounces nitrate of silver in 1 quart (32 fl. ozs.) of water; dissolve 2 drachms citric acid in 6 fl. ounces of water; add the latter to the silver solution and make up to 2 quarts in a wide-mouthed bottle of about 5 pints capacity. Then add concentrated aqua ammonia, constantly stirring with a glass rod, until the precipitated citrate of silver is re-dissolved. After this is done, add in the same manner strong nitric acid (it may be the commercial) until the second precipitate is re-dissolved, or it is just as well to stop adding the acid before the solution is quite cleared up, *i.e.*, when, after stirring, the solution is still a little turbid. The reaction now

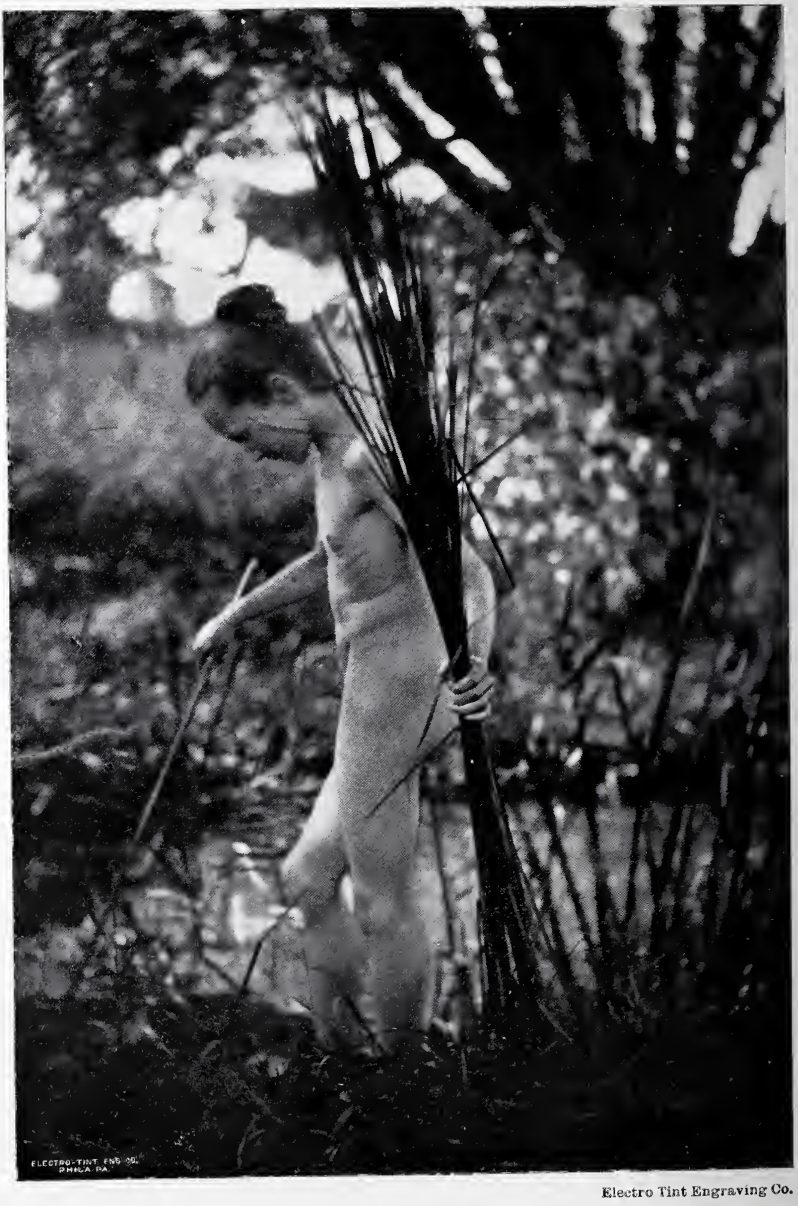
is strongly acid. It has taken about a like quantity of each acid and ammonia to bring the solution to this point. First, it was strongly acid with citric acid (citro-nitrate of silver); second, it was strongly alkaline with ammonia-citrate of silver dissolved in nitrate of silver (ammonio-citro-nitrate of silver?); third, the citrate of silver is precipitated the second time and re-dissolved, by the aid of nitric acid, in the ammonio-nitrate of silver, forming, I suppose, a citro-ammonio-nitrate of silver.

But it is not yet ready for use; it does not possess the most desirable toning properties, and to remedy this defect is the most difficult part of the preparation. Unfortunately, the addition of the least quantity of ammonia causes another precipitate. What is wanted is to cross the line of alkalinity again, and at first it seems impossible to do so without undoing the whole combination. It can be done, however, with a little patience. Add a little ammonia at a time, stirring vigorously after each addition, and at length, after a few such additions, a point will be reached when no further precipitation takes place. Now test with litmus paper, and when this remains blue the bath is ready to use.

When made in this way the precipitate is rather too much to be quite satisfactory. But it need not be lost, for when the next bath is made up it may be dissolved with nitric acid and added when the time comes for adding this acid.

Latterly, I have tried what might be called a ripening process, and think favorably of it. After adding the last acid, and again a little ammonia, I let it stand a week before using in a convenient place where it was often passed and where it could be stirred in passing, each time for two or three seconds. In this way the final precipitate is mostly redissolved—a matter of only minor importance.

Now, it will hardly be denied that this is a somewhat peculiar compound, in which the balance of antagonistic forces is pretty fairly adjusted, and it may be possible, perhaps probable, that the low solvent affinity of the nitrate of silver solution for albumen is entirely done away with. If this be so, it marks a decided advance in this branch of silver printing.




Electro Tint Engraving Co.

A NAIAD.

By WILL. A. CADBY.

Along with the satisfaction which the use of this bath gives me, I can hardly refrain from mentioning that I also rather enjoy the *absolute* failure of the "blister" nuisance. I have not seen a single *fresh* sample in a year. All I do to prevent them is to add (while the prints are in the hypo) ½ to 1 drachm of a 5 per cent. solution of carbolic acid for each printed sheet to the water into which they are to be placed from the fixing bath. This should be stirred with the water before adding the prints, and there should be not less than 1 pint of the latter to each sheet. I also add, hardly knowing why, a little salt—say ¼ to ½ ounce for each sheet. After standing for an hour, or all night, in this water, it seems impossible to "raise a blister" on any print so treated by soaking any length of time.

By way of postscript, I will add that the above bath solution, if stopped at the second stage, which I called the "ammonio-citro-nitrate of silver," makes an excellent bath for plain paper, with which matt-surface prints may be made, which, being thoroughly toned with gold, very closely resembles platinotypes, and will probably last just as long, providing no hypo is left in them These *might* truthfully be called "bogus-platinos."



A SNAP SHOT. BY C. C. LANGILL.



AFTERNOON TEA. BY JOHN E. DUMONT.

## THE AMATEUR'S STUDIO.

BY JAMES REUEL SMITH.

THE studio of the amateur is not unlike the place of business of the man whose "office is in his hat," as it is usually wherever that personage happens to be.

Perhaps four-fifths of city amateur studios are located in back yards, for it is not unusual on looking out of an upper window, over the fifty or sixty of these in a side street block, to see several non-professionals busily at work posing their acquaintances.

A goodly number of friendships are also broken every fine day on roof tops, and any one looking with an opera-glass from a high down-town office building is in hard luck if he does not descry at least a dozen operators at work during the luncheon hour of any bright summer day.




Albany Engraving Co.

A NOVEMBER DAY.
BY ALFRED CLEMENTS.

For the small number who work in-doors much has been written upon the utilization of the side window, and the methods by which it can be made to produce sky-light effects. To the facile all things are easy, but to the average amateur, portraiture in the house has probably proved, even under the most efficient printed directions, a delusion and vexation, and it is to these that an easy and happy deliverance out of all their difficulties is now suggested, by the route of the hall stairway to the bonâ fide skylight that every dwelling in the city possesses.

Ten minutes' work will convert the upper hall of any house or flat into a better portrait gallery than can be made out of any room and side window with two hours' labor, and while even the back hall room boarder will find this space always serviceable, the private house amateur can, at a very slight cost, fit it up for a permanent studio, that shall still be an open thoroughfare, where, given the requisite artistic taste, every light or shade effect desired may be produced.



BY THE STREAM. BY C. BAER.



Copyright, 1895, By R. Eickemeyer, Jr.

"IN THE WANING LIGHT"
BY R. EICKEMEYER, JR.

# THE MINUTE STRUCTURE OF PLANTS.

BY MAXIMILIAN TOCH.

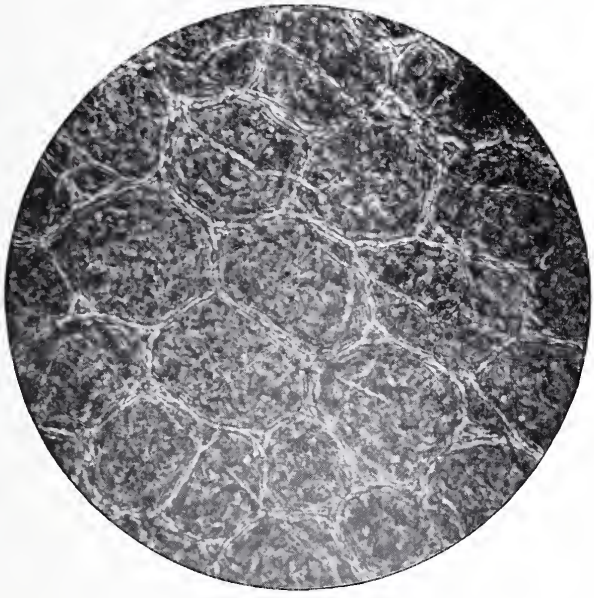


By J. W Dunn.

PROF. SCHLEIDEN, of Jena, established the so-called cell theory of plants about 1832, and somewhere about 1846 Prof. J. W. Draper, of the University of the City of New York, photographed the cellular structure of a growing tomato with the aid of a microscope. This, of course, was a daguerreotype, and, although crude in a measure, it was a highly scientific accomplishment. In 1873, Dr. C. Heitzman, then of Vienna, now of New York, established the existence of the reticulum and reticulated structure in animal tissue For fully fifteen years microscopists attempted to refute this theory, and it is fairly well conceded now that the animal tissue is pervaded by a reticulum, and the so-ealled cell theory is one connected mass from beginning to end. Dr. Heitzman inferred the analogous condition existing in plant life, and in 1884 Dr. Louis Elsberg began his investigations and contributed several papers to the "Quarterly Journal of the Microscopical Society" of Great Britain. Dr. Elsberg immediately found a number of opponents who disputed his theory and his methods. All of Dr. Heitzman's and Dr. Elsberg's illustrations are taken direct from drawings, and as no two specimens are alike, microscopists were loud in their attempted refutations, and described these illustrations as largely imaginary. Dr. Elsberg died shortly after his last paper was written, and Dr. Heitzman, in whose laboratory I

was then engaged, deputed me to take up the subject where Dr. Elsberg had left it. I soon saw the truth of the theory of reticulated structure and the intercellular connection in plant life, but I positively refused to publish anything on the subject until I had succeeded in photographing the subjects with high-power objectives.

Take the case of a novice looking at the spectrum of



SECTION OF TOMATO PEEL, 1200 DIAMETERS.

barium. At first he or she will not see more than half the lines in the field, but if you pointed out with a comparative spectrum the number of lines, in a short time the whole number can be seen and identified. So it is with viewing the structure of a plant by the aid of a high-power objective. A novice cannot see the intercellular connection unless the condition is correct and the specimen properly prepared, but after the particular features are pointed out there is no difficulty in recognizing them. As it is only practicable when you have a skeptic at your side to convince him, I concluded that the only reliable method would be to photograph the

conditions and they surely could not be disputed. I succeeded in 1891 with my first high-power photograph on this subject, and in 1892 I read a paper before the Meigs Medical Society in Philadelphia, and I had no difficulty in convincing every one of the physicians in the audience. The methods I use in photographing have been described at length in the July number of *The Photographic Times* in 1895, and also in various other photographic periodicals. The methods of staining are more or less unique, because I do not use basic anilines, inasmueh as tannin is contained in living plants; a precipitated color in the form of a lake clogs the specimen. I therefore, for plant structures, use only the azo anilines, which are not affected in this manner. The accompanying photograph is a section of the tomato peel, taken with a 1/12 objective and magnified 1200 diameters.*

The conclusions I have arrived at are as follows: The harder the substance is, the more are the interruptions in the cellulose and the more marked the reticulated structure. The softer the substance, the less are these conditions apparent. For instance: the rind of any vegetable substance displays the intercellular connections very plainly and the centre or pulpy portion does not, unless the protoplasm be stained with chloride of gold and exposed to the light. The ivory nut, pineapple, geranium stem and fresh woods show these conditions very plainly. Low powers are valueless for the determination of these interruptions, and with high powers the light must be diaphragmed down to a minimum.

* The negative was made on an Eagle ortho plate, by sunlight filtered through an aurantia screen. Time of exposure thirty seconds.—M. T.



By Harry & Marie Platt.



"CAN IT BE FIXED?"
BY JESSE POUNDSTONE.

# LIGHT IN LANDSCAPE.

BY G. VIEUELLE.



FIG. 1.

IT has often been said that in reproducing nature the photographer cannot replace the artist; he has been reproached with not being able to seize only that which seems to him should compose his picture and eliminate from it, like the painter, the weak, or simply unsightly points. It would suffice to cast a glance on the works of our most skillful amateurs, and to bring to mind, notably, the exposition of photographic art organized last year by the Photo Club of Paris, an exposition which brought together for the second time the élite, the adepts of the camera from all countries, to be convinced that, in the hands of men of taste, photography is able to respond to the greatest exigencies and pretend to the highest destinies. Doubtless, from a certain point of view, it will remain inferior, precisely because the operator is not able, like the painter, to modify at will nature's aspect; but when



FIG. 2.

it is a question of seizing quickly the magnificence and brilliancy of a landscape of which the fugitive lighting constitutes all the beauty, how much superior does it not seem to the pencil, however rapid it be, to the palette even, however charged with rich colors, but which would have to be instantly transferred to the canvas. In picturesque photography, once the lines of the subject decided upon, — and here is revealed the artist, who does not fail to place himself at such a distance, and at such a point that everything is balanced in the picture which he wishes to compose,—it may be said that the lighting is the only thing to be considered; it is the principal factor of success. On the lighting depends the beauty, the relief of the landscape; it is the light which shows us the object in view, by the amateur, the effect that he wishes to secure. If the positive image is skillfuly executed—if the processes are judiciously chosen, the final work should reflect the personal sentiment of the author and create the impression which he himself felt. Habitually, and in the most frequent cases the full light of the sun is utilized. His rays are those which warm and pervade the verdure, giving to the distances those vaporous and indefinite tones which should always be respected. Thanks to him, aerial perspective is rendered with all its correctness; nevertheless a good diffused light may in certain cases be preferred, then the picture will be less brilliant, often softer, if the time of



FIG. 3

exposure is sufficient, but the *ensemble* will gain in harmony. What it is especially important to observe is the direction of the light, for it is from this that the artist will draw all his effects. As a rule one should avoid having the sun directly behind him, and this is easily understood, such light giving only a flat picture without relief; but if the light strikes the object either from the left or the right, everything is changed, the picture gains in vigor, in modulation; the shadows thrown are slightly vanishing, the projections are sharply brought out. This effect is especially noticeable in monuments, and constructions in general,



FIG. 4.

whose carvings require to be clearly defined; with the sun directly at the side the relief is extreme, the shadows thrown are stumped naturally, all the details are clearly in sight, the photograph, in a word, is no longer simply a faithful picture, it becomes a fine vignette, which charms and seduces by its vaporous aspect.

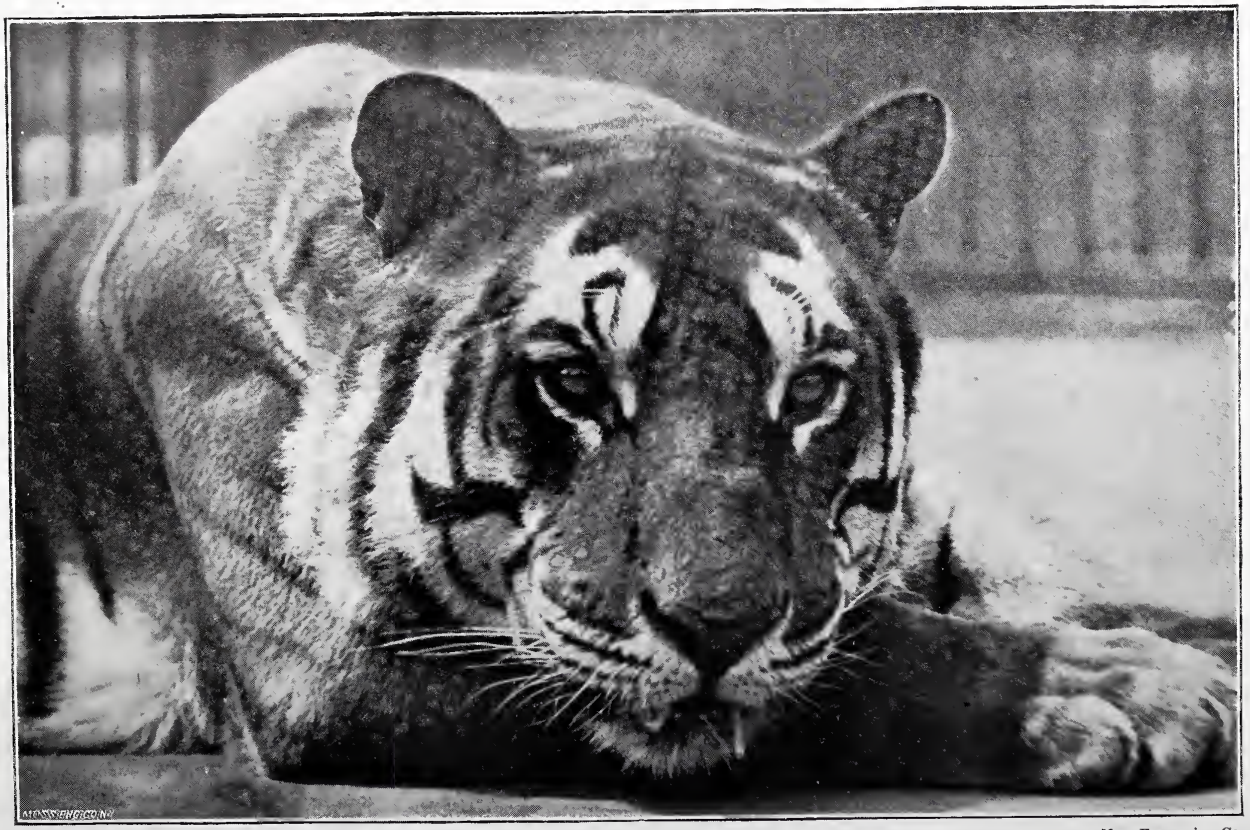
Sometimes the amateur seeks the effects of light coming from directly in front of him.

In this line it may be said that the mine is in a degree inexhaustible, the sky with its capricious and changing clouds, which in itself is sometimes a perfect picture, will not fail to fix the attention of the observer; the sea, like-

wise, whose waves give back, like so many stars, the dazzling reflections of the sun. For the rest, whatever may be the motive which tempts the photographer, he can try to fix it on his plate. It suffices in general to prevent the sun from shining directly into the objective; wait until it is hidden behind a cloud, or place the camera in the shadow of a tree, wall, or bridge. If necessary, the lens may be shaded by placing one's hat a little above it. Nothing, therefore, is impossible; a little daring, and one will be surprised at the unexpected effects obtained especially in the case of instantaneous views, a suitable development, of course, being presupposed. Is it not thus that the most skillful operators have been able to entitle their pictures: "Sunset," "twilight," "the approach of the storm," "after the rain," etc.? In closing, let us say a few words in regard to the sky, too often neglected in ordinary photography. A white sky is an anomaly, a blemish which disfigures the finest picture; but when the clouds, whose variety is infinite, are well rendered, when the landscape harmonizes with the sky, which is like a background to it, the photograph ceases to be common, but becomes at once artistic. If it is impossible to obtain at the same time the sky and the landscape, it need merely be mentioned that the method of double printing meets such a case; the only point on which it is necessary to dwell, is that when making the negative of the sky, it must not be forgotten that the direction of the light must be the same as in the landscape to which it will be adapted later.

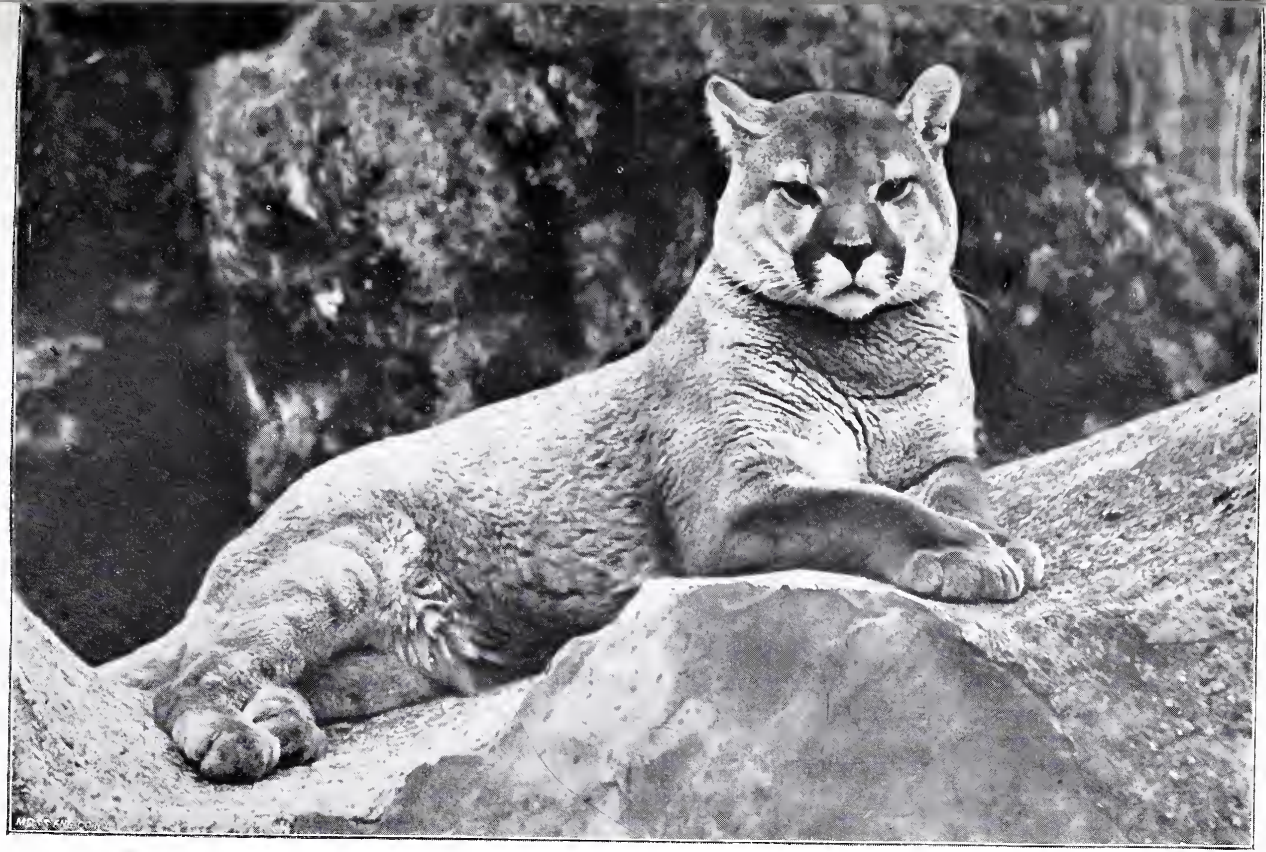


FIG. 5.



Moss Engraving Co.

"WAITING FOR THE DINNER HOUR."
BY H. DIXON.



"MEDITATION."
BY H. DIXON.

Moss Engraving Co.

# DEFINITION AND DEVELOPMENT.

BY OTTOMAR JARECKI.



Cissy's Wink. By Sarony.

IT would seem strange at first thought that definition—sharp, clean drawing—should be mentioned in the same breath with development. But a series of happenings has hammered the fact into me, and clinched it, too. Once upon a time, through following injudicious advice, going with a hired camera, I found myself in the possession of half a hundred exposures on which double and triple the amount of light had acted that was desirable. Furthermore, some previous hireling had apparently and carelessly slipped a cog or two on the focusing rack, and the pointer, trustingly set at the 100 feet mark, focused the image accurately somewhere in space, but not on the surface of the film. Here, then, was a double flatness to combat; an over-full exposure and a fuzzy focus. After trying faithfully the prescribed developer—pyro, with variations and under various and extraordinary restraints, this had to be given up.

Fortunately, we are sufficiently out of the woods in these latter days to have a fairly clear conception of the distinctive properties of the various developers in the market. Of the newer ones, eiko, amidol, and metol, we know that they are of the soft detail-giving order, coupled with a tendency to thinness. Pyro is all right, but is under the suspicion of holding back some of the image that the above series would have brought out. Hydrochinone, especially with the car-



EVENING.

By ALFRED CLEMENTS.

bonates of sodium or potassium, or both, is the density developer without a doubt. This developer was used on a part of the above exposures. Although ordinarily working slowly and requiring 15 to 20 minutes for full development, in the above case, with greatly reduced alkali, the development was complete in 5 to 8 minutes. The result was much better, in fact, excellent contrast, as might be expected from hydro; but there was a distinct gain in definition. This was unmistakable. General outlines were sharp against the sky, and wherever high light and shadow joined, there was distinct demarkation. As to the theory, it might possibly be that the full development of the high lights encroached upon and swallowed up the fuzzy outlines of the shadows, in accordance with the lateral action that gelatine films are often charged with, and which interferes in getting "black and white" results in process work, for instance. Practically, there was a great improvement in the negatives and resulting prints.

Another circumstance occurred about a year later. In trying various cameras, a certain public building had been used as a sort of test object. A trial exposure had been made on a new film, but owing to interruption of the development, brought about by the enforced absence of the "developer," the result was a thin, delicate negative, which, with a lens giving sharp definition, would have been acceptable; but, as it was, the cresting of the roof and top of the tower stood out hazy against the sky. Afterward another exposure was made on the same roll of film, the development with hydrochinone was carried fully to completion, and definition showed marked improvement.

I know that in this matter I am allowing definition to be crowded very closely by the factors of density and contrast, but definition by itself is a distinct gainer, as experiment will convince any one.

In these days of wholesale photography, when one is likely to have a lengthy series of similar exposures to deal with, whenever it happens that the films or plates themselves are disposed to work flat, or there is over-exposure, or the lens work is not up to the standard, either from the inherent

defect of cheapness, or from using too large a stop, if it is borne in mind that there is a power at hand in restrained development and the employment of a density-giving developer, the best can be made of a bad fix, and the best will be a manifest improvement.

Since the above was written, the whirligig of time has brought uppermost to the writer's attention that old stand-by of developers, ferrous oxalate. This shares the properties of hydrochinone of a restraining, density-giving tendency, and is well adapted to circumstances such as those just mentioned. Being acid in its nature, it behaves entirely different to alkaline developers as affecting the gelatine of dry plates. One sometimes comes across plates, usually those long on hand, although it may happen even with perfectly fresh but defective plates, that the whole range of alkaline developers will produce fog, with lack of contrast and density, coupled with a possible greater evil of softening of the film. Here the ferrous oxalate is most excellent. With two different brands of plates, both of which fogged, and one, in addition, completely melted away in the developing pan, the remedy was the oxalate developer, giving astonishingly bright, clean negatives, as compared with the results obtained by the alkaline developers. Plates of this character are often very rapid, the rapidity pushed to the fogging point in the manufacture, hence exposures are hardly appreciably longer than usual, and the keeping of the stock solutions for this developer are not at all troublesome.

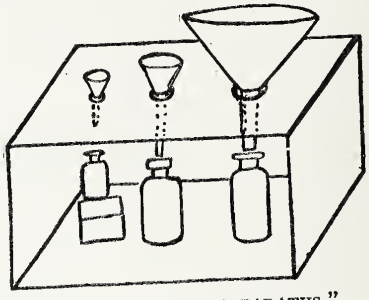
And so, without straining the point too closely, as to "snappiness" of negatives, whether produced by good contrast of light and shade, or by good definition, if any one is afflicted with the opposite failing—flat negatives—let him apply the remedies above suggested.

## FILTER YOUR DEVELOPER.

W. J. HICKMOTT.

THE value and importance of filtering the developer is not appreciated by most photographers, both amateur and professional. In fact all the solutions employed in the making of the negative give much better and clearer results if they have been carefully filtered. In the early years of my work I did not appreciate the value of the filter, and it was almost by accident that I came to adopt its use in the preparation of all the solutions employed in the dark-room. I had had trouble at times, coming on periodically and lasting a short time, with small transparent spots in my negatives. After a short season the trouble would disappear and everything would go smoothly for quite a while, and then I would begin to have the clear spots again. In a certain case of plates I had used nearly the entire lot, and they were clean and perfect in every way until almost the last box. This box for some reason showed the clear spots after development and fixation. They were not round, but the majority of them wedge-shaped or straight lines. All of them were very small, but large enough to almost ruin the plate, and they were exceedingly difficult to spot out. I tried dusting the plates with a soft cotton cloth, and with my brush that was in constant use, but still got the spots and specks. Taking the plate into strong daylight I examined it carefully, but could discover nothing wrong in the coating. It was apparently perfect. I went into the dark-room to mix a new developer for another plate, but did not put down the yellow screen before the lantern. I noticed that my developer was getting low, and that the alkaline solution was rather thick. I poured out the usual quantity of the alkali and held it up to the light, and at once discovered the cause of the peculiar and troublesome spots on my plates. The solution was full of minute crystals floating about and gradually settling to the bottom of the graduate. In a few minutes these crystals had all settled to the bottom of the graduate and left the solution clear, but when the developer was poured over the plate

these crystals went on to the plate also and at once settled on its surface. Being at the bottom of the graduate and falling last upon the plate, and at the upper end, as the developer was swept over the plate, that end of the plate always got the most of the crystals, and on coming out of the fixing bath always looked the worst. In the case of portraits, I noticed that I always got the most spots at the top, where they were most difficult to remove, and when they had settled over the face the negative had to be thrown away. Where a crystal settled the developer could not act, and on fixing there was left a minute spot of clear glass in the negative just the size and shape of the crystal. On filtering the remainder of the solution, and the elimination of the crystals, the trouble entirely disappeared. Now



"MY FILTERING APPARATUS."

when I have spots on my plates I look first to see if my developer is clear before condemning the plate. If any of the chemicals have been precipitated in the form of crystals, or the bottom of the bottle shows that the solution is not clear, I pass it through the filter. It sometimes happens that more of the chemicals will be held in solution at one time than another, and it is sometimes necessary to filter two or three times in order to keep the developer clear. In mixing the developer by the aid of the red light these cyrstals are not readily discovered, and it is well to take the developer into good strong daylight occasionally and examine it carefully. My filtering apparatus is a simple affair, and is illustrated by the cut above. Anyone can make it, and the expense is next to nothing. It is simply a

box with three round holes cut in it for the funnels to rest in, and large enough to take in the bottles underneath. The operation of filtering is too well understood to enter upon a description here.

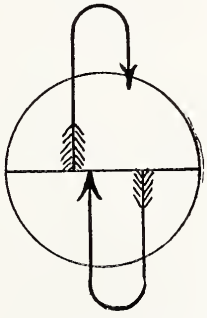
## A THEORETICAL STUDY OF PHOTOGRAPHIC SHUTTERS IN INSTANTANEOUS PHOTOGRAPHY.

BY S. HEMINGWAY, M.D.

THERE are of necessity many subjects in photography which are governed by and require instantaneous exposure. To meet this demand many shuterst have been devised, and all of them with the intention of giving to the field the full requirement of exposure, so that each and every part of the plate shall get its equal exposure, and not a double exposure of any portion of the plate.

When one will carefully examine many prints and at times reproductions, it will often be seen that there is a very

Fig. 1



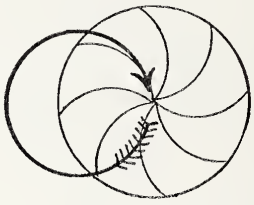
evident centre with a gradually diminishing lack of definition to the margins of the plate.

With the present rapidity of plates and lenses, where only the fractional part of a second is all the time required for a full exposure, it stands to reason that in instantaneous photography of to-day all parts of a plate shall have an equal exposure, and successively cut off light as fast as it enters the lens.

These remarks apply especially to the taking of photographs at universal or general focus ; for it is conceded that in taking of very near objects, distant ones cannot at the the same time be in focus unless it is as specified above in this paragraph. When all parts of the field are in focus these remarks apply regarding the action of shutters. Generally speaking there are four varieties of shutters.

Fig. 1 is used with slight modifications, but all with the same action. The arrow heads indicate this action, namely: that part of the shutter A moves upward, and at the same moment the part B moves downward, and then the reverse occurs, and the parts A and B rest at the horizontal line, as in the illustration. By this double action it can readily be appreciated that the central part of the picture is more than

FIG. 2



doubly exposed and the extreme margins get the greatest minimum of exposure.

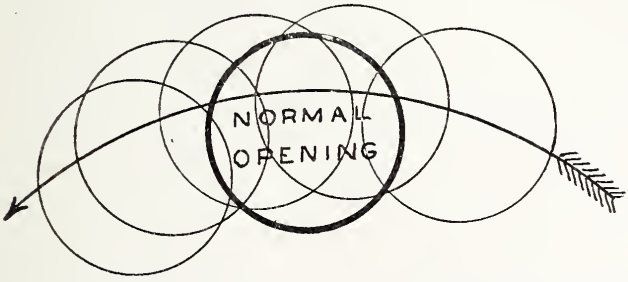
It would, therefore, appear that the ratio of the exposure of the centre to the circumference is as 2 + to 1.

The iris shutter (Fig. 2) acts on the same principle as that of Fig. 1. As the iris shutter starts to open it begins at the centre and goes to the periphery of the circle, and then returns to its original condition. It is the chemical change caused on the sensitive surface of the plate, by exposure to light that gives the results, and if there be too much exposure an over-exposed plate results and *vice-versa*. If, therefore, as demonstrated above, the exposure is governed by the duration, which, of course, is so, of the action of light, in these two shutters there is less exposure at the margin of the plate, or, in other words, circumference or margin = 1, and centre = 2 +.

Stopping down can modify this, but we seek the greatest amount of light compatible with perfect definition.

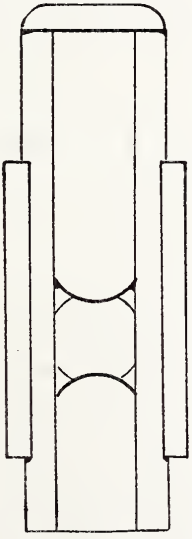
The third form of shutter is one that successively cuts off light as fast as it enters the lens, giving no undue expos-

FIG. 3




ure to any part at the expense or over-exposure of another part. To illustrate: take two silver half-dollar pieces, place them edge to edge with one resting its edge upon the

FIG. 4



lower one and slowly pass the upper coin completely across the lower one (see Fig. 3), and it will demonstrate the action of the Waterbury shutter.

I have yet to see a plate wherein all parts were not, even to extreme margin, full of detail with this shutter.

The Scovill shutter, as shown in Fig. 4, I have found a most excellent shutter, and it also acts by giving a full and equal exposure. By reversing the shutter so that it moves upward instead of downward, one can get the sky effect very prettily, and by gently retarding its motion on the landscape part of the picture most excellent results can be obtained. To retard its movement can be accomplished by inserting into the slot on either side at about the sky line very thin slivers of wood fitting snugly inside these slots. It is tiresome work, and as the shutter is entirely of wood, it cannot be depended upon in continued damp weather.

I hope to have soon one of these shutters in aluminium with an adjustable ratchet, and a "detainer" to be set at the sky line to act as a momentary check for longer exposure to the landscape. Although the caption of this paper is "A Theoretical Study," etc., the writer has seen many times the faults mentioned in the beginning of the subject. These are simply the observations of an amateur.

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## THE MANIPULATION OF THE HAND-CAMERA.

### Hand-Camera "Drill."

BY PROF. W. K. BURTON.

PERHAPS it would be better—certainly less Johnsonic—to call it the "handling" of the hand-camera. It is about that I am writing in any case—about the actual touching of the camera by the hands, and of the adjustments made thereby.

I have done not a little hand-camera work—probably as much as most who, fully admitting the advantages of the hand-camera, are still old-fashioned enough to believe that, *other things being equal*, the larger the negatives the better. I have also used many kinds of hand-cameras—and from this very reason is a great part of the mischief.

The mischief is that I have had far too many failures. I have done some hand-camera work that is at least fairly good —some of it has been published in the form of enlarged collotypes in albums, and the public has paid shekels for the same—always a practical test.

Still, the percentage of my failures has been too great, and the climax was reached a few months ago when, issuing forth with a perfect beginner, we worked for a couple of days together, and my failures largely outnumbered his. This set me to look out for the cause, if not for his success, at least of my own failure, and I was soon able to find it, or rather *them*, for I found that there were two causes. A number of the failures were to be attributed to the fact that I had not given my *entire* attention to the subject, but had divided it between the subject and the camera, with the various adjustments of the latter. Others were to be attributed to error in judgment of distance of the principal, or nearest, object. Further consideration showed that the first cause of failure was only to be removed by regular "drill" practice with the camera. The action must become so automatic that the attention is no more taken up with the mechanism of the camera, than is that of a sportsman in ejecting an empty cartridge, substituting a new one, closing his gun and lifting the hammers. All mental effort that there is, must be concentrated on the subject. The way to acquire this automaticity is simple enough, but is tedious. It is to be acquired by going through all the operations of changing plates, making the necessary adjustments of the camera, and exposing, over and over again, say, for half an hour at a time, day after day, till all can be done while the attention is given to something entirely outside the camera; these operations are being performed in the time till, for example, it is possible to read a book, and understand what is written, as can the weaver while casting his shuttle across the loom. In my own case, about ten hours of practice has brought me very nearly to this stage, with one particular camera, and I do not intend to rest till I have reached it.

Then about errrors in estimating the distance. I first investigated to find if any errors inclined to be "systematic."

That is to say, if they inclined to be generally in the direction of over-estimating or if under-estimating distances. I found that I had been erring distinctly in the direction of under-estimating. The knowledge of this fact alone enabled me at once to reduce the number of my failures greatly. Much more was wanted, however. It ought to be possible automatically to adjust the focus, as well as to make the other adjustments of the camera. I therefore went in for a regular "focusing drill." This was carried out by walking about in the garden, selecting every half minute or so some conspicuous object to the right or the left, turning the camera toward it, and at the same time adjusting the focus rapidly. The distance was then paced to find the direction of the error, if there were one. I may mention that I have had much practice in pacing in connection with engineering, and can pace—or in the case of a very short distance "foot"—within a very small percentage of error.

The improvement was rapid and very great, and after a few hours—not consecutive—thus spent, I found that I could focus very nearly automatically, with only trifling errors, by *feeling only*. That is to say, without looking on the scale of the camera at all.

These matters may appear trifling, but they are not. I am now convinced that the chief factor for technical success in hand-camera work is practice. Of course this can be got by the actual use of the camera, but the time will be long and the number of plates spoiled large, while it is doubtful if as great facility will *ever* be acquired as by the "drill" that I have described. I think I have, in the case of my own hand-camera work, reduced my failures, due to actual manipulation of the instrument, to 10 per cent. of what they were a few months ago.

## FLASH-LIGHT FOR AMATEURS.

BY WILLIAM W. FOX.

NO doubt many amateurs have been deterred from experimenting with the flash-light owing to the costly nature of the powder, as well as to the high price charged for any but the small hand machines. But brass rods, iron frames and nickel-plated mountings are of no more use in a flash-light machine than are silver mountings or oil polish to a camera. They add to the appearance of each, but there their usefulness ends. Early last winter I began experimenting with a machine of my own, and after making three or four alterations on it I threw it away and started out with another idea, which, I am pleased to say, proved a success. The whole machine cost about three dollars. I am sorry I cannot accompany my description of it with a photograph, as I am writing this beside a little nameless river in the northern wilds of Canada, and have nothing but a few sheets of brown wrapping paper to write on. However, I shall try to give an intelligible description of the machine, so that those who wish to try it will be able to build one for themselves. I may say, that with a machine somewhat similar to the one I am about to describe a prominent professional photographer and myself took a picture in the Grand Opera House, Toronto, which proved a success. Sothern was playing in "Lord Chumley," and the scene selected was the last act in that play.

My first attempt consisted of a framework of horizontal bars, but I discarded it for perpendicular ones—thus rendering the apparatus less unwieldly and at the same time admitting of a greater command over the light. First of all, I made four boxes of oak twelve inches square and two inches thick, with a hole one inch square mortised in the centre of each. Four pieces of ash about an inch square and seven or eight feet long were next procured, and one end made to fit smoothly into the mortised holes. This formed for uprights. On one side of each of these another piece of ash, one inch by half an inch and of the same length as the uprights, was

made to slide by cutting a slot at top and bottom and fastening them loosely to the uprights by large-headed screws (see Fig. 1). Next, I got thirty-two tin pill boxes of about half an ounce capacity, pressed out of flat metal so that there would be no chance of leakage. In the lid of each a small tin tube, half an inch long and about three-sixteenths of an inch in diameter, was soldered. They were loosely filled with candle wick, one end passing up through the tube, and these, when filled with alcohol, formed my lamps (Fig. 2). An equal number of pieces of heavy tin, 6 by 2 inches and bent at right angles, were then procured to form a support for the lamps (Fig. 3), and these were attached by screws to the uprights from near the top to within about three feet of the lower end, four on each side. Thirty-two more pieces of tin were next obtained to form the cups. These were two by two and a half inches. They were turned up half an inch at both ends, forming a little trough 2 inches long by 1½ broad (Fig. 4). A hole was punched through the sides of the flanges at one end and the machine was ready to be put together. Four holes were bored through the uprights at points marked about four inches above where the lamps were to stand, and a piece of one-eighth-inch wire between five and six inches long drawn through, thus allowing about two inches of the wire to project on each side. On these projecting pieces the little cups were placed, gravity, of course, working them, hung downward. A similar piece of wire to that supporting the cups was next passed through the sliding pieces on the uprights, but about three inches under the cup wires. Now, by lifting the sliding piece and turning the cups over, the latter were supported at one end by the wire in the upright, and at the other by the wire passing through the sliding piece. A small piece of wood three inches long was next placed under the slide to form a trigger. This trigger had a string attached to it to jerk it out of its place at the proper moment. The lamps were then placed on the little shelves and each cup, or trough, had a certain proportion of flash powder (not pure magnesium, as its action is too slow), carefully placed in the centre. When all was ready the lamps were lighted, the four trigger strings taken to one side, and

at the word "fire"! the supports under the sliding pieces were jerked away, the slides fell, simultaneously dumping the contents of the cups into the flame of the lamps, and all was over. I found, however, that the force of the discharge knocked many of the lamps from their supports, and so I had some half-inch wire pins soldered to the bottom of the lamps. These fitted into holes in the tables, and after that no more trouble was experienced with them falling.

Another improvement was a safety pin which passed through a hole in the slide into the upright, and was not removed till the cups were loaded and everything ready to fire.

With this machine I have done some good work during the past winter

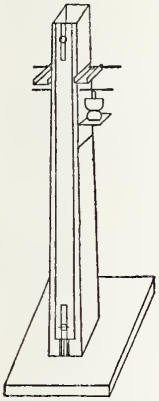


FIG. 1.



FIG. 4.

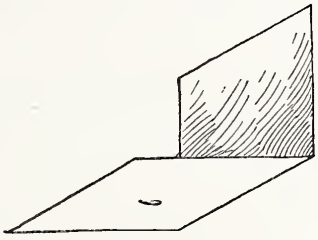


FIG. 3.

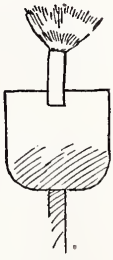


FIG. 2.

In taking a large parlor, for instance, three uprights may be placed at one side of the room and one at the other, to soften the shadows. In fact they may be arranged in any desired position.

## LANTERN SLIDES.

BY ROBERT E. M. BAIN.

MUCH otherwise good lantern-slide work is spoiled in appearance for want of proper mounting and finishing.

Slides, to present an attractive appearance, should be handled carefully and with clean hands, free from grease. Many slides which have passed through my own hands have a greasy appearance, from careless handling on the part of the maker, that detracts greatly from their appearance and frequently injures their exhibition on the screen.

After a good washing and brushing over, under the tap, with a soft camel's-hair brush, they should never be touched again on the film surface for any purpose. The cover glass should be carefully inspected, as it comes from the manufacturer frequently with a series of fine scratches on the surface, that would pass unnoticed, except under examination. These scratches, being magnified on the screen at the same time as the slide, sometimes spoil the appearance of very good pictures.

A very handy form for making mats is made from thin sheet brass in the form here illustrated. The brass should be of the quality known as half-hard, and after the form is cut out with a pair of tinners' shears, the edge should be beveled with a small file.

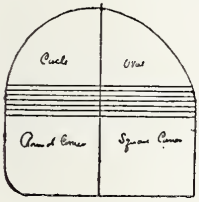
By folding the paper for the mat twice, placing under one of the four corners of the form and cutting around with a pair of sharp scissors, a clean cut mat of the shape desired will be the result.

Many amateurs have complained in my hearing that it is a great trouble to obtain strips for binding. This is most easily obviated.

Call on or send to "Dennisons," and they will, for a few cents, cut up into ¼-inch-wide strips, half a dozen sheets of ready-gummed paper of any color desired. These can be cut into the proper lengths as needed, and for 25 cents enough can be had to supply one for years. The expendi-

ture of that amount has supplied me with material enough to mount more than 500 slides. Ready-gummed paper in half-inch widths will suffice for labels which will stick, and when dry can be written on with pen and ink. Do not forget to place the thumb labels in the proper place, and be sure to have them white, and place the number of the slide on them, rather than on the label, as it can be referred to more easily.

In placing the label, be sure to see that it is on the right-hand side of the cover glass and that the thumb label is on the lower left-hand side. Lantern pictures should be mounted so that the opening in the mat will not be more than three inches in diameter, but have them of that size whenever practical, that they may dissolve with the proper effect on the screen.



Slides with different sizes of mat opening frequently spoil the effect of the dissolving view.

A frequent cause of failure in lantern exhibitions is caused by the operator moving the lantern or the slide after it has been thrown on the screen. When the view is thrown on the screen properly focused the effect on the audience is that of a landscape viewed through an open window, but let the slide be "adjusted" ever so little and the effect is at once lost and the picture becomes flat and uninteresting. If the slide has not been properly put into the carrier, immediately return the last picture to the screen and make the change before again exhibiting the slide, but after it is on the screen *let it alone.*

## A SIMPLE DEVELOPMENT PAPER.

BY D. W. SMITH.

IT may not be amiss to call the attention of those who are interested in the matter, to a formula for a plain development paper that has the merits of good results together with simplicity and cheapness. While its rapidity is greater than the salts of iron or blue print process, yet, it is not too much so for a certain kind of work and class of manipulators. Its degree of sensitiveness is measured by the fact that it must be prepared and handled by yellow or lamp light. This method of printing has often stood me well in hand in lieu of the more perfect bromide paper, and the writing of this I trust will be of help to others and at the same time afford a basis for further experiments as to its possibilities.

*Its Preparation and Use.*—Procure some plain photographic paper, or a good quality of flat-cap, providing the latter be of a smooth surface and not too porous, otherwise the result will not be satisfactory.

To sensitize: make a solution of common salt and water, 5 grains to the ounce, float the paper on this until it lays flat, or brush it over with any handy substance, blotting off the superfluous portion and dry. For the next step a solution of iodid-nitrate of silver will be required which may be made as follows: Nitrate of silver, 30 grains to the ounce of distilled water, to which add carefully a solution of potassium iodide, 2 grains to an ounce of water, until no more of the precipitate formed will dissolve in the silver solution; when filtered, acidify with nitric acid, until blue litmus paper turns red. The previously salted paper is to be well brushed over with this sensitizer, using a swab of absorbent cotton, or, better float the paper on the silver bath in order that the surface may be uniformly wet. When the paper ceases to curl, hang up to dry and it is ready for use. For solar enlargements it works much quicker if used before drying, but for contact work it can only be used dry. Expose until only a faint color is seen in the high lights. To develop, use



Copyright, 1895, by Charles I. Berg.

A PORTRAIT.

By CHAS. I. BERG.

a tray or even a piece of window glass the size of the picture upon which the paper can easily be handled ; flood the paper with water giving it a slight washing, then while wet pour over it the developer, flowing it back and forth until the image is well out. Immediate washing arrests further development. The developer is made as follows : Protosulphate of iron, 15 or 30 grains to the ounce of water, according to the degree of energy needed. Add to each ounce 4 to 8 drops of concentrated ammonia ; add to this drop by drop of sulphuric acid, until the iron solution becomes clear. The picture thus formed is perfectly stable, but is liable to change somewhat ; to prevent this and at the same time improve its color, it should be immersed in a 50 per cent solution of hyposulphite of soda, containing a free solution of nitrate of silver. An old fixing bath will do very well for this purpose, after which wash well and dry, or the picture may be toned with chloride of gold solution as in aristotypes, and so give a wider range to color and finish. The development is quite energetic, but if the paper be of good quality it will give a picture with clear whites in the high lights, and a pleasing brown to black in the shadows.



IN THE MARSHLAND. BY JESSE POUNDSTONE.

## THE SEA.

BY H. P. ROBINSON.

LOVE of the sea is the heritage of every man of English descent, and knowledge of it in all its wonderful effects grows yearly more and more among all classes. Each year the sea takes increasing hold of our painters, and pictures of the sea cover more space on the walls of our exhibition galleries, but there is still room for the great photographer who would make the sea his own; there is still room for photographs in which we can feel the sensation of the



I. HOLY LOCH. BY H. P. ROBINSON.

power and glory of the ocean, the salt spray, the gloom, the brilliancy and the infinite movement.

We have lately lost our greatest sea painter in Henry Moore, R.A. No painter ever represented the sea so faithfully, and yet made his picture look less like a colored photograph, than Moore. His work was the highest impressionism without the least touch of the eccentricity and affectation that so marred the work of the impressionists of a few years ago, but which is now disappearing. One reason why he gave us the spirit of the sea so faithfully was that he always painted straight from nature, and never asked photography to help him. He had every temptation to make use of our art. In the early days of photography he experimented extensively. For forty years he was my intimate friend, and took the

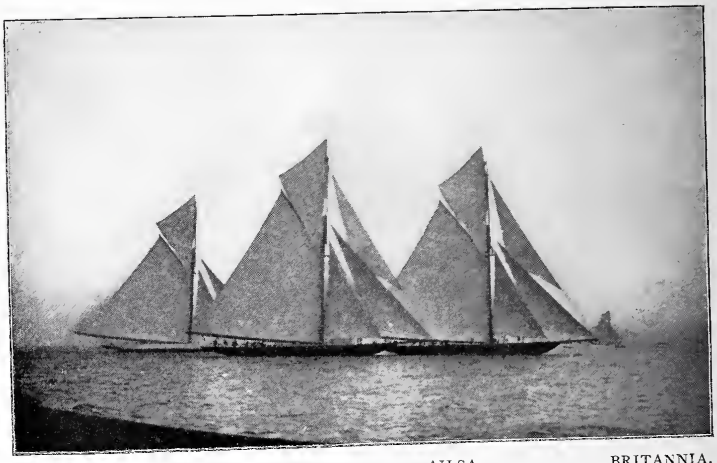


2. MR. HOWARD GOULD'S "ATLANTA." BY H. P. ROBINSON.

greatest interest in photography; yet he never used our art for pictorial purposes; he took a higher view of photography than using it as a hand-maid would imply. He looked upon photography in its higher phases, as a kindred art to painting, not as a mere servant or assistant of the painter, and took the greatest interest in our Salon, speaking at length in our discussions on art subjects held during the exhibition season. I have mentioned him here because his pictures seem to me to be of the kind one should aim to produce, simple pictures, in which incident is not the chief purpose, but giving the absolute expression of the sea in its many phases.

Not that I object to incident in a picture, but, on the contrary, I prefer to see some cause, beyond a mere study of tones, to account for the picture being painted. I certainly do not wish to appear to belong to those who parade their indifference to the quality of the thing said, and think only of *how* it is said Let us have the best workmanship, certainly, but let us bestow our workmanship on worthy objects. Let us put our poem into the very best grammar, but let us

also take care that it *is* a poem, not merely grammar. If anything must give way I really think I could spare the grammar rather than the poetry, or at least a little bit of it. Harmony, tone and texture, admirable as these qualities are, are not incompatible with the employment of subject. The modern objection to incident is too often the result of want of thought, or lack of imagination.



3. VALKYRIE III. AILSA. BRITANNIA.

As a rule photographers are more deficient in those qualities which are derived from impressionism than almost any other, and, as I recommended in the last volume of the ANNUAL, should receive a good deal of the attention of the studious photographer. There are many subjects in which the incidents consist of little more than the harmonies presented to us by certain effects. They are to be found, perhaps, more plentifully at sea than anywhere, and one great recommendation of impressions derived from the sea is that they are not yet hackneyed, neither, indeed, are they within the reach of every photographer, but it happens to some of us. It is my good fortune to be invited to take part in an annual cruise in a large steam yacht, and perhaps a description of some of the photographic incidents in our last cruise,



4. SKY AND SEA. BY H. P. ROBINSON.

with a few of the results of my hand camera, may be of interest and possibly instructive.

The most exciting incident occurred early in the cruise, and I will describe it at once, though it will require some introduction.

All yachtsmen have heard of the Clyde fortnight. During this period the great regattas of the Clyde take place. The racing was unusually interesting this year on account of the trials of the grand new yacht, *Valkyrie III.*, which, as I write, has just arrived on your side of the water to take part in the contest for the America cup, a trophy we have not been able to regain from you for nearly fifty years. The race seems to excite more enthusiasm with you than with us, and everybody will know how it ended long before they read this.*

We spent some days "potting" everything deemed worthy of a plate. On Friday, the 5th of July, we were at Hunter's Quay, in Holy Loch, ready for the races on the morrow. The little sketch (1) will give some idea of the peaceful effect as night closed in. The schooner, with her

* The races proved that there are really too many excitable people in the world, and not enough water space near America for a fair yacht race—and for pleasure steamers at the same time.



5. SEAGULLS. BY H. P. ROBINSON.

topmasts struck, is the *Selène*, tender to *Valkyrie III.* Many of the men of the racer pass the night on her. A boat, crowded with her men, may be seen going on board. One of the most magnificent pleasure boats present this year hailed from New York. Mr. Howard Gould's steamer, *Atlanta*, is shown in the next illustration (2). The owner also owns the *Niagara*, a new and successful 20-rater.

The exciting incident was as follows: It will be remembered, even by those who care little or nothing for yachting, that last year, at the same place, and at the start of a race, the *Satinita* ran into *Valkyrie II.* and sank her, Lord Dunraven and others having to jump overboard. A new yacht was one of the consequences, and this year the three great competitors were Mr. A. B. Walker's *Ailsa*, Lord Dunraven's *Valkyrie III.*, and the Prince of Wales' *Britannia.* On the morning of the race our Captain was told that I wanted to get as near to the start as could be allowed, and he obeyed to the letter, with the consequences that last year's catastrophe was nearly repeated. We had scarcely got into position when *Ailsa*, followed closely by *Britannia*, which was pressed by *Valkyrie* (each, of course,



6. ON THE HEATHER BELL.

trying to get the weather gage), bore down upon us stern on. Now, taking a close sectional view of the end of the bowsprit of a racing yacht is akin to looking down the throat of a big gun when it is ready to roar, but these wonderful new yachts turn in little more than their own length, and just as *Ailsa* was near ramming our broadside she went about beautifully and just escaped collision. *Britannia* was not so fortunate; she tried the same manœuvre but collided slightly with *Ailsa's* broadside, damaging some ornaments, and doing no further mischief than spoiling the start. *Valkyrie* just missed *Britannia* and proceeded on her way, but seeing the others in difficulties, in the most sportsmanslike manner returned, as shown in the photograph (3) to give her competitors a fresh start, although according to racing rules she might have gone on and secured a great advantage. All the time this was going on I got some useful snap shots. It was curious the next morning to see the reports of the incident in the papers all different, except that all abused our boat, and all wrong. One even expressed some pious horror at the photographer appearing to think of nothing but his photography, when it seemed to demand a miracle to save his boat. But I find it difficult to do two things at a

time—and wanted the photographs. One of them was peculiarly useful afterwards. It showed the start-boat between *Ailsa* and the camera at the moment of collision, absolutely proving that we were strictly in our right place—with perhaps, I will allow, not a foot to spare, showing the use of photography as a witness.

Perhaps I have given too much space to this incident, but it was an interesting photographic experience.

Besides yachts which are graceful and beautiful, there are some more common objects of the sea not so beautiful, but more picturesque. I mean the old sailing ships, barges, colliers and fishing boats, as well as those trading steamers that give off vast volumes of smoke which take fantastic forms and often add greatly to pictorial effect. These are best sought for at the mouths of great rivers. As I have said above, what I should like to see studied at present are the effects of sky and sea. Nos. 4 and 5 are examples of what I mean. Seagulls are by no means difficult to secure, and I have many negatives of them. Nor is all this chance work. I had already taken a negative of the view off Arran, shown in No. 5, when two seagulls were seen making their way toward us. They were deliberately waited for, and snapped as they passed, giving, as figures of all kinds always do when properly managed, much greater interest to the view as a picture. Some of my negatives contain hundreds of gulls, but numbers do not always add to effect.

Groups on board are often interesting, not that I give the final illustration as an interesting one. It shows part of the deck of the *Heatherbell*, on which some few photographers may recognize the present writer enjoying one of the happiest moments of his life.



THE SEA. BY HARRY PLATT.



American Photo Engraving Co.

"LE DINER EN RETARD."
BY J. CHESTER JERVIS.

# THE ART OF NOT POSING—AN INTERVIEW WITH NAPOLEON SARONY.

BY GILSON WILLETS.

"THE art of posing is in not posing. The true pose is not a pose, but a natural position." Thus, as we climbed the stairs to his studio, Mr. Sarony laid down the law. Napoleon Sarony is both photographer and artist, but he is first of all an artist. And because he is an artist he is a successful photographer, and his success qualifies him to lay down the law and gives authenticity to his views which he so courteously permits me to reproduce here.



MR. BLAINE.
Just reaching the point of a story.

He cares not a fig for anything but his art, and will not talk of anything else if he can possibly talk of his work.

"So when we photographers take a picture of a person not posing," he continued, when we were shut up in his little private *atelier*, "we have fallen into the habit of calling it a snap shot. Now, a good snap-shot picture requires the use of all the art the photographer commands. It must be taken at the moment the subject is unconscious, and at his best. Look at this picture of James G. Blaine, for instance. Mr. Blaine was relating to me some humorous incident.

"'Are you ready to take my picture?' he asked, when he had finished his story.

"It is taken, I replied. I had caught him just at the right moment when he was reaching the climax of his story, and the photograph is the very best I have ever seen of him."

And Mr. Sarony regarded the picture affectionately, while he explained that successful snap-shot pictures of that sort require three conditions: first, an acquaintance with the

habits and life of the subject, second, confidence, or a surrender of self on the part of the sitter; third, an atmosphere of genuine sympathy between sitter and photographer.

"A snap-shot picture taken under these conditions," he went on, as he searched nervously through a pile of photographs,"—is generally far more successful than one taken while the subject is conscious. Once conscious, the sitter begins to pose, and falsely. Of course, the photographer who risks snap-shots should have already studied his subject and know the particular positions in which his man appears at his best. The moment a person is told to 'look natural,' that moment he will look what he feels—perfectly idiotic. He feels that he is posing—and posing is for professional models only.



MR. DEPEW.
Always conscious in his photographs.

"Observe this photograph of Mr. Depew. He looks conscious, doesn't he? Too conscious! Did you ever see a photograph of Mr. Depew in which he did not appear conscious? Never! Posing, my boy, too much posing. He has never had a picture taken that does him justice. He never looks natural. If he could be caught unawares sometime during a political speech or in a merry moment when he is reaching the point of an after-dinner story, Depew could then see himself on cardboard as he really is.



MODJESKA.
Exhausting work. Unsympathetic.

"While many, like Mr. Depew, cannot pose and yet remain unconscious of self, there are others who can pose to order, and that immediately, with any required expression. Even actresses, however, cannot always lose self when sitting before the camera. Modjeska is one of these. 'I'm exhausted,' she said to me one day after she

had sat for six different characters. The ordeal was practically fatiguing, for she cannot throw her whole being into a part without the contagion of the audience. If she only could, her photographs would be far more satisfactory.



MODJESKA.
Needs contagion of audience to forget herself.

"It is evident, therefore, that many can be photographed to look naturally only by means of a snap-shot, a picture taken when the sitter doesn't know it. And therein lies the use of the art of not posing. The shot must be made by a sharp-shooter, for the game cannot be bagged by a careless sportsman. To seize the opportunity when the unconscious subject is at his best—there's the test of the expert. When Wilkie Collins came to me, I discerned a peculiarity of facial expression when he talked about his own books, which was most interesting; so, while he kindly answered a question or two for me about his "Woman in White," I made a quick exposure, feeling that I had taken the great novelist at his best. And so it proved. When he returned to England, he wrote me: 'You have taken just the sort of photograph I like. Those taken of me over here are perfect libels, but I feel like giving your pictures to all my friends.'"

Here Mr. Sarony laid two photographs side by side, and invited my opinion of each. One was Lester Wallack, the other the great French actor Mounet-Sully, who was here last year. "Wallack's is stiff," I said, and "Mounet-Sully's is natural."

"Then let these pictures," said the artist, "go as examples of the second conditions of a successful snap-shot portrait—that is, confidence, the surrender of self on the part of the sitter. The most difficult persons to take are those who will not place confidence in the photographer, who are self-willed, refusing to, or unable to lose self. Often the most charmingly, unconscious persons in ordinary times, are the very ones who are all self before the camera. Of Lester Wallack, recognized in

his time as the handsomest man on the stage, there are only one or two photographs that do him justice, and all through his own fault. Look at his face here—can you question that he was self-willed, head-strong, bound to be his own photographer? He forgot the art of not posing. Instead of lending himself to me as an artist, he would say imperiously: "Take me this way.' When I begged him to change his pose just a little, he would only repeat: 'No! No! take me this way.' So, vexed with his obduracy, I took him 'this way,' the result being what you see now, a crude, awkward, bungled picture, a libel of the handsome, graceful Wallack. The most amusing part of all was that afterward he would come to me furiously: 'Sarony, why did you make such a wretched picture of me? Didn't I give you full play?' But now turn to this of Mounet-Sully, which you pronounce a natural picture. He is of a nervous temperament, and difficult to photograph. At first he was over-quiet and overdignified in his pose. He lacked confidence in me. His manner froze me. I realized that we must get better acquainted. Monsieur, I said, you doubt me, but you must put full confidence in me before I can take a picture worth perpetuating you. And, sure enough, he came the next day full of confidence, all his nature unbent, and he sat for his



"RUY BLAS."
Meditative. Not posing.



M. MOUNET-SULLY.
As Hamlet. Entirely unconcious.



M. MOUNET-SULLY.
Lost in his part.

picture, but he did not pose. The result was this, a picture worthy of his genius."

Again Mr. Sarony selected two photographs from the packet—both of Grover Cleveland: "Now here," he said, as he laid them before me: "are illustrations of the third conditions of the art of not posing,—that is, sympathy and magnetism. Upon this, even more than upon confidence or unconsciousness, depends the success of the snap-shot portrait. Between the photographer and the sitter a silent chord must be struck. There must be harmony, a current of magnetism or of sympathy —whatever you choose to call it, between artist and subject. Understand, I believe that a want of sympathy is not always the fault of the sitter. I might not myself feel in sympathy with the person sitting. It was the lack of this sympathy on my part that accounts for the great difference between the first photographs I took of Mr. Cleveland and the last. You will notice that this picture of the President is reserved, haughty, while this one is warm, alive, sympathetic. Well, when Mr. Cleveland first sat for me, he was frigid, reserved, haughty, apathetic. Accordingly, the first photograph of him bespoke those characteristics. Not so this last one, however, for on this occasion he gripped my hand with great warmth, and said most cordially: 'Napoleon, I can't stay away from you.' At last we were friendly and this photograph taken that day shows the friendliness and human warmth and interest in the man."



GROVER CLEVELAND.
Reserved, cold, unsympathetic.

Copyright, 1892, By N. Sarony.



GROVER CLEVELAND.
All sympathy, interest and friendliness.

And Mr. Sarony threw aside the photographs, saying with conviction: "I thoroughly believe that the art of not



CHILD STUDY.
BY J. F. RYDER.

Buffalo Electrotype Engraving Co.

posing should be studied by every photographer, and that the conditions I have cited to you are the chief elements of success."

## THE AMERICAN PHOTOGRAPHIC SALON.

BY ALFRED STIEGLITZ.



IN last year's ANNUAL the writer advocated the advisability of holding an American Photographic Salon, to be conducted on similar lines to the one held annually at the Dudley Gallery in London. Unfortunately a whole year has elapsed without a move having been made in this direction. This is probably due to various causes, of which we shall speak later on.

The time has certainly arrived when the United States should have its Photographic Salon, more especially so now that the Joint Exhibitions of New York, Philadelphia and Boston, having fully served their purpose, have ceased to exist. The year 1895 has passed by without a single first-class photographic exhibition having been held in this country—a very unfortunate state of affairs. The interest in pictorial photography is daily increasing; its exponents are becoming more and more serious and earnest in their work, and it is an absolute necessity for them to be able to compare each other's methods and results. This can only be accomplished through an Exhibition.

Photographic exhibitions in other countries are gradually decreasing in number and greatly increasing in quality. Medals are being abolished in high-class exhibitions, and only the very best work hung. In order to insure success in this direction, the committee or body of men in charge of such an exhibition must be *representative* in every




The Electro Phototype Co. Phila.

A LOMBARDY PLOUGHING TEAM.

By J. CRAIG ANNAN.

respect. This is one of the great difficulties to be overcome in this country. Of representative workers there are but few, and these being spread over an immense area, the best ones know but little, if anything, of each other, thus preventing social intercourse, a valuable consideration in the promoting of an exhibition. This difficulty no other country has to contend with. Then, too, the United States consists of very many principal cities, all contending to be *the* city of the country; in short, petty jealousy prevents Americans from recognizing a metropolis. England has its London, France its Paris, Austria its Vienna, etc., etc., but the United States has its New York, Chicago, Philadelphia and Boston. In the writer's opinion New York is the natural centre for American art, and he would therefore propose it as the city in which the Salon should be held.

Another difficulty we have to contend with is, that the American's enthusiasm is rarely very great unless he sees a likelihood of turning his labors into dollars and cents. The writer has approached several of the recognized leaders in pictorial photography, questioning them as to the share of work they would be willing to undertake in the proposed Exhibition; the most prominent of all, a man of means, replied in a condescending manner that "*he was willing to show his pictures*" (*!!*), but that "he did not think he could give the cause any time"; and still this very gentleman preaches about art photography in America and complains of the lack of interest taken in pictorial work on this side of the water! Notwithstanding all these difficulties, there is hardly any doubt in the writer's mind that a Salon is merely a question of time. In order to assist those who may have the same object in mind and who may be working for the same cause, the following points may be of value:

1. The Exhibition should be purely pictorial; only work to be hung which shows individuality and is of artistic value.

2. The Exhibition should be international, and, for this reason, the Committee should consist of (say) twelve Americans, four Englishmen, two Viennese and two Frenchmen. These twenty gentlemen could work hand in hand. Naturally, all expenses would be defrayed on this side of

the water. These twenty men should be representative pictorial workers and accepted as such throughout the world.

3. The advisability of raising a guarantee fund of one thousand dollars, in order to ensure the success of the Exhibition. There are so many wealthy men and women interested in photography that the raising of this amount of money would not be a very difficult task.

4. A Special Committee should have charge of framing all foreign work—framing to be an important feature.

5. The hanging of the pictures and decorations of the gallery to be similar to those of the Art Exhibition at the Champs de Mars in Paris, in order that each picture would be shown to its best advantage. This is of great importance.

6. The Exhibition ought to be run as an Art Exhibition and not as a cheap Fair; the Catalogue would therefore have to be kept in harmony with the general tendency of the whole.

In short, everything connected with the Exhibition should be STRICTLY first-class.

It would be well to infuse a social element into Salon features as this would in all probability ensure its financial success.

Let us hope that the United States will soon show the world the finest collection of pictorial photographic work ever seen, if only to make up for all its former deficiencies and backwardness.



Copyright, 1895, By R. E. M. Bain.

WATER CARRIERS, CAIRO. BY R. E. M. BAIN.

# ORTHOCHROMATIC PLATES WITH AND WITHOUT A SCREEN.

BY W. A. COOPER.

I HAVE recently made for the *Century Magazine* a set of 10 x 12 negatives of the paintings by the great American artist, Seargant, in the Boston Public Library, when the use of a screen would have been of inestimable value, but when the public character of the building (unusually crowded just then by the Christian Endeavorers attending their annual convention) prevented a long exposure.

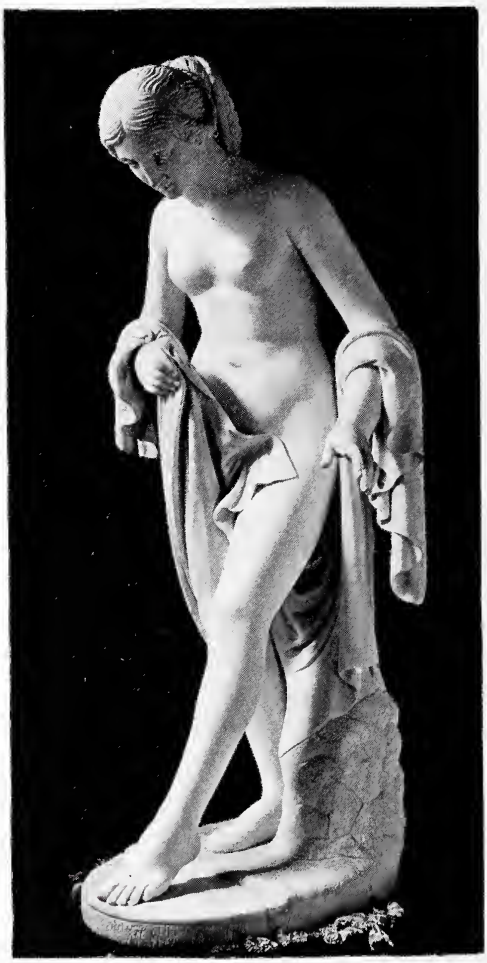
I got along splendidly with the grand figures of the prophets, they being quite free of blues and yellow, and being strong and vigorously painted, would lend themselves easily to an orthochromatic plate, quite as well as with a screen. In fact here was an instance when a screen would



Made on a Wuestner's Imperial Non Halation Plate.

STUDIO OF THOS. SHIELDS CLARKE. BY W. A. COOPER.

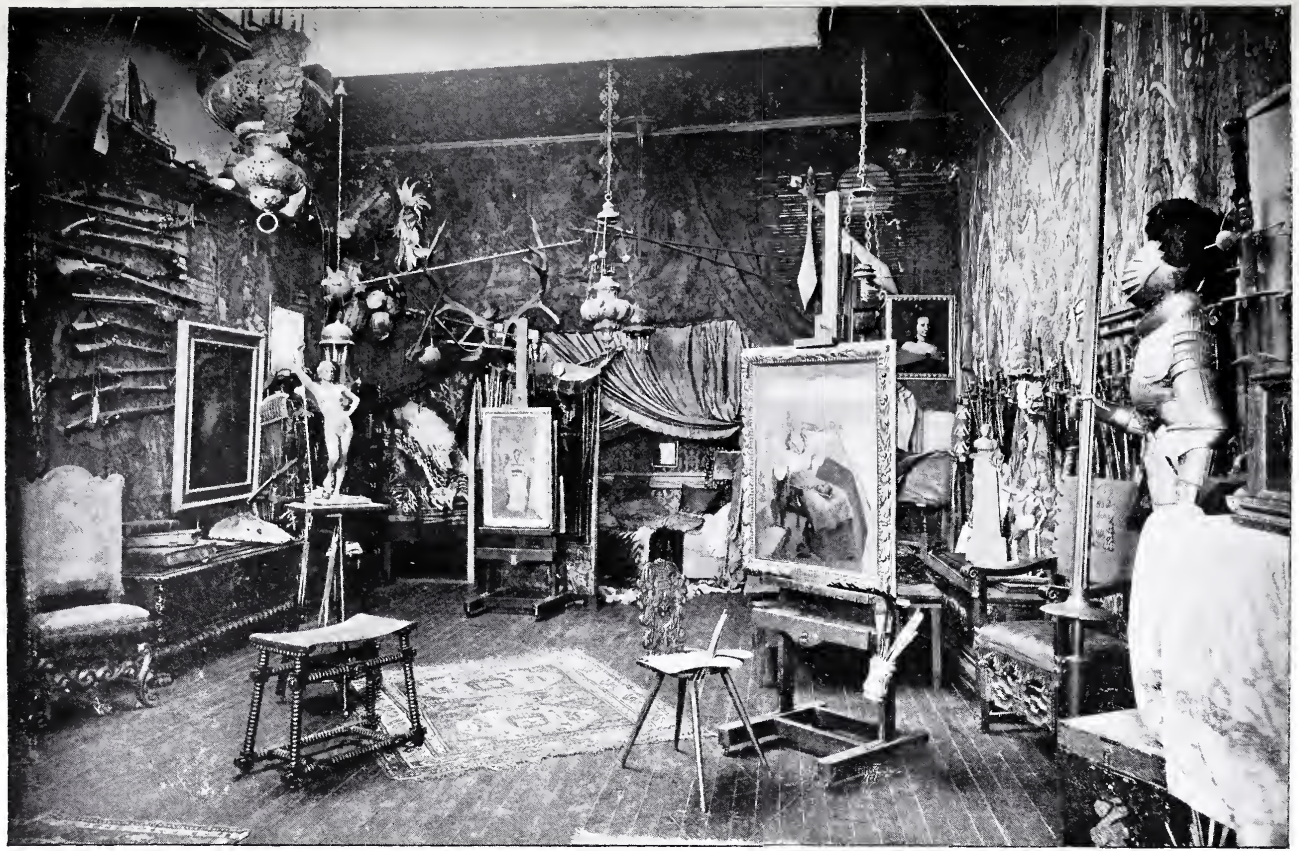
work a positive injury. The purples and blues in the draperies were in such a low key, and in such excellent photographic keeping with the bluish grays running through the blacks, that a screen would have held the blues back too much, thus destroying the color values.



Made on a Wuestner's Ortho. Plate. By W. A. COOPER.

The large panel just above the group of prophets, and symbolizing the bondage and persecutions of the Children of Israel, was a different story. Here all the improvements in color photography were demanded, because of the great number of symbols used, and the variety and extremes in color, from the light blues in the foreground to the brilliant whirlwind of red wings at the extreme top, representing Jehovah.

I could not use my screen for the reasons given, so exposed an orthochromatic plate, timing my exposure for the deep reds if anything a little over-exposed, and developed with very little pyro, to prevent the blues getting too strong, and kept my plate well



Made on a Wuestner's Orthochromatic Plate.

STUDIO OF THOS. SHIELDS CLARKE.
BY W. A. COOPER.



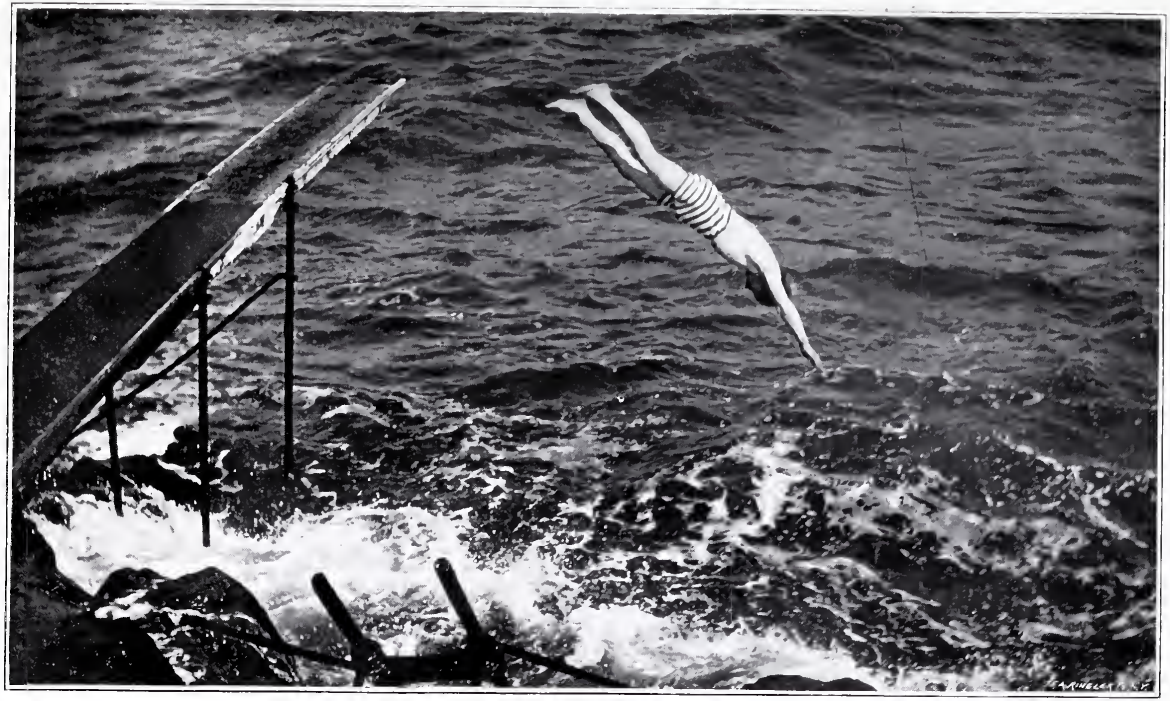
Made on a Wuestner's Ortho. Plate. Copyright, 1895, by J. G. Brown.

FROM THE PAINTING BY J. G. BROWN.

under control with bromide during a rather long development for proper strengh, and the result was a good negative, with color well preserved.

I was called recently to copy a painting intended for one of our courts of justice, which at first glance seemed easy to do. I made an exposure on an orthochromatic plate, using a long-focus lens and the smallest stop, with a fairly good light in the artist's studio, and gave it 45 seconds. The artist advised me to make several exposures, saying it had been copied a few days before and the results were quite unsatisfactory. I looked the painting over carefully. I determined if I made a second negative I could use a screen, a very light yellow one, I always carried with me. I placed it back of lens, and, without changing the light in any way, I gave an exposure of three minutes, about four and one-half times as long as the first negative. They both developed up nicely and were generally good negatives. But with this difference:

Over the head of the figure of justice were a couple of Cupids, holding two shields, the front one, in gold, having



F. A. Ringler & Co., Eng.

THE DIVER.
BY LOUIS MELDON.

on its face symbols in blue. In the first negative, without a screen, the gold shield was dark and the blue symbols very light. But in the second negative, with a screen, the gold shield was very much lighter, and the blue symbols very much darker, reversing the contrasts and giving a better conception of the artist-work, viz., a light gold shield, with dark blue symbols, just as the eye saw it.

It is but fair to say that the plates used were Wuestner's orthochromatic, and the interiors shown in the illustrations were made on his non-halation, which I have found in every instance to work with the most gratifying results.

## A DEVELOPING-ROOM LIGHT WITHOUT HEAT.

BY O. G. MASON.



On the Desert. Jesse Poundstone.

ONE of the important requisites in the practice of modern photography is a good non-actinic light by which to conduct work in the developing or "dark-room." By non-actinic light is meant one which may be used—with proper precautions of distoner and length of action—for the examination of very sensitive plates before and after exposure in the camera. During many years of his early practice with gelatine plates the writer used solar light—properly filtered through colored media—for his developing-room, and was quite satisfied with it. But later he found such light to be too irregular in quantity for many purposes, owing to dull and cloudy weather. The judgment of the operator is likely to be led astray in estimating the amount of chemical effect produced by his various solutions while developing the image on an exposed plate.

After careful examination all the various means of arti-

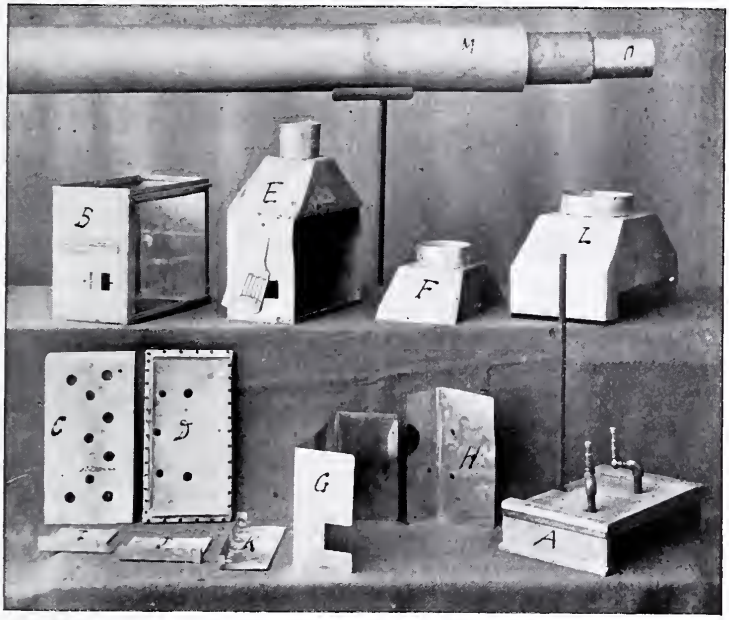



ILLUSTRATION SHOWING THE VARIOUS PARTS OF THE LANTERN.

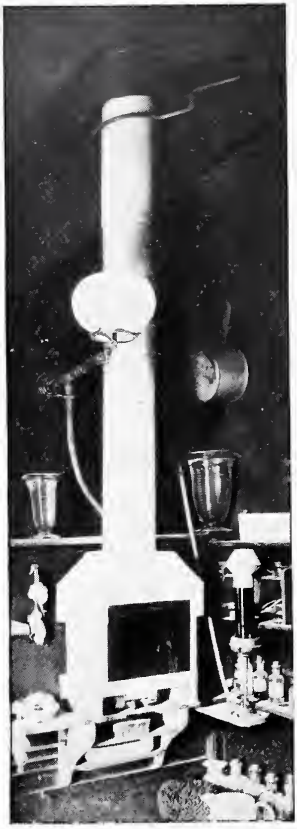
ficial illumination in general use were found to have defects or objectionable features; if the source of light was of sufficient capacity to give adequate illumination when properly screened with colored medium the factor of heat becomes oppressively apparent.

Placing the light in another room, or outside a window, is not always convenient or less objectionable. For the purpose of obtaining a safe, comfortable and efficient light in the developing-room, a series of experiments was began early last summer resulting in the adoption of the method herewith described and illustrated.

Although the developing-room used by the writer is well ventilated through a window in the open air, and has several openings in the ceiling, yet it was thought best to devise a method which while lighting a room would also assist in its proper ventilation. That the system may be plainly understood, the artificial light corner of the developing-rooms is

shown in Fig. 2, and the details of the new lantern are seen in Fig. 1. A fair estimate of its size may be formed by comparison with surrounding objects.

The easiest way to describe its construction will be to take the several parts shown in Fig. 1 and put them together ready for use, as seen in Fig. 2.



THE LANTERN COMPLETE.

First upon the burner platform A we set the shell B, and into this we lay the perforated bottom C, and on this we lay the second bottom D, which has a return flange on its lower side by which the two bottoms are kept about one-half inch apart.

The burner pipes pop up through holes shown in the central longitudinal part of each bottom—the burners and elbows—having been removed while this part of the setting up was done—are then replaced. The shell or lining box E is then lowered into B, and is held in position by its bottom edge fitting around the outside of flange shown on D, leaving an air space of about three-fourths of an inch between the two shells B and E. To this space air is admitted through the line of holes seen around the edge of D. F is then put on, forming a top for B. The lower edge of this top fits into rebates—light-tight—in the top of B.

We now have a double shell with air space between and ample provision for supplying that space with cool air. G and H are tin, light and heat reflectors placed behind and below the gas burners. On the top and bottom of the large square opening in B are rebates into which colored glass or

other light-tinting material is easily slid, and when these last named have been put into position their *ends* are covered in light-tight by I, J and K, which slip into guides on the ends of B. Access to the inside is had for lighting—with a taper—through the pendulum and sliding doors shown in B and E respectively. L, the outside or top canopy is then placed in position where it is held by proper guides which keep it three-fourths of an inch from the top and sides of B and E. By having this top shell short—covering only the highest part of the lantern a free circulation of air is secured for carrying away any heat which may pass the two inner shells when the body of the lantern has been put together, the three pipes M, N and O are placed in position one on each shell rim as shown, having one inch air space between them, their upper ends enter a T-shaped 8-inch pipe passing through the roof. The outside *lantern pipe* 5 inches in diameter leaves an annular open space in the 8-inch roof pipe. through which heated air along the ceiling may escape; thus producing good ventilation. The lantern pipes are held central in the roof pipe by a "ring brace" seen fastened to the ceiling in Fig. 1.

With both burners in the lantern turned for full gas flame, and after long use in warm weather, the outside shell and pipe seldom reach blood-heat.

The comfort of working in a cool, well-ventilated room far outweighs the cost of the device.

The metal used for the shells and pipes is sheet wire, chosen from its well-known property of being a proper conductor of heat. The standing gas pipe shown on the back of platform A is connected by rubber hose with gas pipe above the lantern, as shown in Fig. 1, and below the platform with stop cocks for regulating flames of the burner; these stop cocks are so arranged that by a single motion the flame of one or the two burners may be turned very low or to full capacity. After two months almost daily use I am able to say that the lantern is in every way satisfactory.

As it was made in time taken in "busy days" and with restricted facilities, its somewhat rough appearance could be greatly improved.



Lux Engraving Co.

"GRANDMOTHER'S LUTE."
BY MABEL O. WRIGHT.



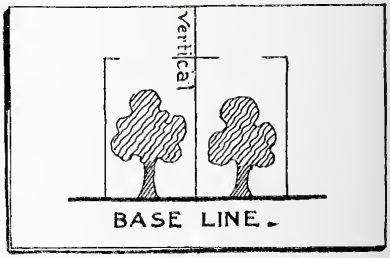
John Beeby, Engraver.

"MEMORIES."
BY KATE MATTHEWS.

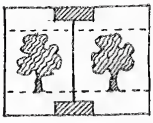
## THREE IDEAS FOR THE STEREOGRAPHER.

BY H. HARFORD WALKER.

FIRST. To transpose the negative. First tack an 8 x 10 card on a squared 10 x 12 board. With a glazier's diamond cut your negative, using a T square, and cut according to lines drawn on your card thus:




Second. To mount the transposed halves. Procure some surgeon's silk isinglass plaster (court plaster). Put two halves of negatives together, edge to edge. On upper and lower margins (I use 4¼ x 6½ plates for 3 x 6 print) scratch film and apply a small piece of the plaster well moistened, for hinges. Here it is:



You can now fold the film side in and they will be protected, and at the same time you have less than half the weight of a negative mounted by the old method.

Third. To print titles on views. Procure a piece of roll film and strip it of the gelatine. Upon this write your title with an opaque ink (I use indelible ink) and fasten to the film side of the right hand negative (after transposition) with the title reading backward. Use mucilage and fasten only at the ends with a very small particle of it.

The above hints are the result of many experiments, and I believe they will prove invaluable to those doing this kind of work.

# PRACTICAL COLOR-PROCESS WORK.

BY J. HORACE MCFARLAND.



The River Road. H. G. Douglas.

GREAT scientists, even, have indulged in much wild theorizing, and so many failures have been scored, that there may be much justification for the frequently-made statement that the three-color process is as yet impracticable for commercial work, save when such statement comes from editors who, with ample opportunity for investigation, fail to look beyond their noses.

At the same time, the fact is incontrovertible that color-process work of superb quality is being constantly turned out commercially and practically in the establishment of the Colortype Company here in New York. I shall give some account of this work, upon request of the Editor of the ANNUAL.

With proper ray-filters, each capable of selecting its exact proportion of a primary color, and with the corresponding individual orthochromatizing of the dry-plates used for the various exposures, it is possible to obtain regularly three negatives from any subject which shall embrace in the separate values for yellow, red and blue all the color in the subject. In obtaining these negatives from varied objects some curious facts have come to light, which, however, only go to prove the correctness of the theory and practice

resulting from the discoveries of Dr. Vogel, brought into real use by William Kurtz.

It is found that natural objects give the best results, for the reason that Nature's coloring is never indefinite nor her media impure. Though the red of the strawberry is but a small fraction of a inch in depth, no hint of the underlying white flesh is found to modify the color-value negative. The contrary is true of the work of man—too often the vacillation of the artist is in painful evidence on color negatives from a subject of fair appearance. The lens secures a composite of his surface coloring, his first impressions, and the frequently impure paper or drawing board or canvas used as a base for his efforts. Tedious correction only can make up for this.

This indicates the necessity, in preparing studies for reproduction by this method, of the use of a pure base, and the advantage of a definite color treatment.

In photographing flowers it is found that the color values are readily obtained, but much difficulty occurs because of the development of the blossoms during the comparatively long exposures required. Means are now being devised for obviating this difficulty, and it is expected to reproduce the most delicate blossom successfully before many months.

Fruits and vegetables are among the best subjects, and the results are satisfactory both commercially and artistically. The melon study on the opposite page, entitled "Some Summer Delights," is an evidence of the strength of the colori-type process, though much better reproductions have since been made for commercial purposes. The cut watermelon was not fully ripe, nor was it of a variety which showed only a thin rind, as is fully apparent.

The use on this subject of a fourth color, a grayish neutral, indicates merely the dropping of theory for easy practice; the additional color is found to give a generally softer effect and to provide ready means for the correction of impurities in the background materials employed. The neutral printing plate is obtained from one of the primary negatives without difficulty.

During the past year, a wide range of subjects has been



Reproduced directly from the
Melons, on stone, by Coloritype process

SOME SUMMER DELIGHTS

COLORITYPE COMPANY
32-34 LA FAYETTE PLACE, N. Y.

successfully reproduced in color. Now on the steam presses are many exquisite presentations of F. Hopkinson Smith's water colors for illustrating a magnificent volume on "Venice of To-Day"; many of the old and rare Audubon bird lithographs have been duplicated for book illustration, and a work of great delicacy has been done in reproducing some exquisite Chinese drawings. Plugs of tobacco, loaves of bread, Georgia peaches and Ohio apples ; New Jersey muskmelons and Connecticut strawberries have been vividly produced in likeness of color and form, impossible where hand work must be employed. A signal triumph has been scored in a large reproduction of Elihu Vedder's wonderful "Lazarus." Editions of any size, from a hundred copies to ten millions, are produced with ease and rapidity.

The methods employed in transmitting the color values to paper are both typographic and lithographic, equal facility occurring in either, so that in daily practice the one is used most convenient for the subject in hand. In some cases combinations of the two methods are successfully made.

Those doubting the entire commercial practicability, as well as the great artistic value of this process, which has been so sorely belied by a host of cheap imitators and mere theoretic experimentalists, could be convinced by a visit to the American home of three-color work, where, with correct ray filters and the practical application of their results, color reproductions of any object or painting may be had, in delicacy, finish, detail and coloring far exceeding the best lithographic work in any number of colors.



A SHIP ON FIRE AT SEA. BY LOUIS KERR.

## "SPIRIT" PHOTOGRAPHS.

BY HENRY M. PARKHURST.



My Blossom. H. G. Douglas.

PHOTOGRAPHING the invisible is possible owing to the fact that the actinic rays which act upon the negative are distinct from the visual rays which act upon the retina. The prismatic spectrum is photographed far beyond its visibility. Yellow stains upon an engraving, too pale to be noticeable, may be photographed in black. A painting upon a white screen, executed with the bisulphate of quinine, will be invisible, and yet will be reproduced by the camera. The theory that the spirits of our departed friends may be so embodied in a substance emitting or reflecting actinic rays while perfectly transparent to visual rays, thus reproducing themselves in the camera, does not contradict scientific law.

There are numerous methods by which similar extraneous pictures may be produced in a photograph; and it may be interesting to point out the characteristics of these different methods, so that from the inspection of a photograph it may be known how it was produced. To avoid confusion I will speak of the effect upon the finished print, rather than of the direct effect upon the negative, in the application of the criteria.

The characteristics of a genuine spirit picture would be: 1. The transparency of the figure, showing the background through it. 2. Its definite location. 3. It would be sharply in-

tercepted by the body of the sitter behind which it appeared, without overlapping or blending. 4. In consequence of its emitting additional actinic light, it would be, on the average, somewhat lighter than the background; and yet it is probable that it would also intercept some actinic light and would therefore be in some parts darker than the background.



FIG. 1.
A "Genuine" Spirit Photograph.

The most convenient mode of producing an extraneous face without the knowledge of the sitter, is by a separate exposure, either before or after the sitting, printing through a transparency in which the background is opaque. This produces additional black deposit, as it becomes on the negative upon development. The dark portions of the transparency cannot remove the actinic effect produced in the sitting; but the whole effect of this separate exposure is to produce what I may term *plus* deposit. The principal criterion of this process is that no part of the extraneous figure can print darker than the original background. Where the pictures overlap, white may overlap upon dark, but dark cannot overlap upon white.



FIG. 2.
"In the Light of a Friend."

Fig. 1, purporting to be a genuine spirit picture, illustrates this mode of printing; for while the right ear of the sitter overlaps upon the face behind it, although the dark interior of the ear is transparent, there is no part of any of the six extraneous pictures, not even the darkest hair, which is darker than the original background.

Another mode of producing an extraneous face without the knowledge of the sitter, is by having in the camera during exposure a transparency surrounded with clear glass,

intercepting a portion of the light, and thus preventing deposit which would otherwise have taken place, producing what may be termed *minus* deposit. The principal criterion of this process is that every part of the extraneous figure must print darker than the original background. Where the pictures overlap, if the transparency is thin, it will not seriously interfere with the high lights; and white may appear to overlap upon dark from the contrast of the surrounding shade. In Fig. 2, where the young man's likeness stands "in the light of" the sitter, the overlapping of the forehead and the mutual overlapping of the coats, are inconsistent with any imaginable location of the spirit. In photographs of this class, the background is light, and the picture is wholly darker.



FIG. 3.
Disturbed Slumber.

In the third illustration, called "Disturbed Slumber," there is an extraneous picture, partly transparent. In this case, during a part of the exposure, the man in the rear stood in the position shown, and then, the cap being replaced for a moment, he stepped aside, giving opportunity for the background behind him to impress the plate. Inspection of this picture shows that his face is lighter than the background, showing *plus* deposit; and that his cap is darker than the background, showing simultaneous *minus* deposit. This figure could not have been added to the negative by a transparency, either before or after or during the exposure. In this process, neither light nor dark can overlap, excepting upon the background

Comparing this picture with the characteristies of a genuine spirit picture, above given, it conforms in every respect. But it is manifest that the sitter could not have been unaware of the bodily presence of the man behind him. On the other hand, comparing this picture with the two preceding, it is equally manifest that it could not have been produced by either of those methods, or by any similar method.

All possible modes of producing extraneous photographic figures are included in the three alasses represented by the illustrations. The first process includes every possible mode of impressing the plate by light which does not pass through the lens at the time of the sitting, and produces only *plus* deposit. This includes the shadowy figures sometimes appearing from re-using old plates. The second process includes every possible mode of producing a figure within the camera, by light passing through the lens at the time of the sitting, the interception of the light producing only *minus* deposit. The third process includes every possible mode of producing an extraneous figure by the camera at the time of the sitting. In this case there must be a real presence, which, unless emiting actinic light only, must be visible at the time of the sitting.



A SEA OF CLOUDS. BY MANOEL GOULART.

1,713 FT. ABOVE SEA LEVEL FROM PEAK OF THE ISLAND OF PICO, AZORES.



The Bridgeport Engraving Co.

"THERE'S NO PLACE LIKE HOME."
BY ALFRED CLEMENTS.



Binner Engraving Co.

"LITTLE LORD FAUNTLEROY."
BY A. R. DRESSER.

## A REMINISCENCE.

BY H. G. ROGERS.



Schumacher, Los Angeles, Photo.

LONG years ago, more than seventeen, while spending a long sojourn in South Italy for health sake, I remember meeting Mr. W. B. Woodbury, the inventor of the famous process which bears his name. An Englishman, rather stout, with a brown beard and the most engaging expression about the eyes which took you right into their owner's good fellowship—if you loved the Art, and if you loved Italy! While we had been laboriously carrying about our "impedimenta" and "paraphernalia" in the shape of a huge tent, which required twenty minutes to set up in the field, with its silver bath, collodion bottles, iron developer and acetic acid, he, this new star, came along smiling with a neat tripod, that only weighed a pound, on his shoulder, the most beautiful mahogany camera and four double dark slides in a little hand-bag. And he got clouds in the skies of his negatives, too, and used dry-plates which he had made the night before in his private sitting-room of his hotel. Yes, it was a revelation to me! and it was the means of a little friend of mine immediately receiving a present of that awful wet-plate tent for outdoor work, that required twenty minutes to set up! I do not think



Binner Engraving Co.

AN ENGLISH COUNTRY SCENE.
By SEYMOUR CONWAY.

that I shall ever forget my introduction to the "collodion emulsion" as I saw it used by Mr. Woodbury, and his courtesy in showing me a number of wrinkles in connection with it. A stock of clean plates, some dry pellicular emulsion, a bottle of ether and alcohol, some dry pyro, a goodly quantity of carbonate of ammonia and hypo; also, a candle, a roll of orange cloth, a spirit lamp and small piece of sheet iron—that was all; not even a developing tray. First, the pellicle was put into the ether and alcohol, shaken up until dissolved and until the emulsion was formed, and allowed to rest for a few hours. The candle being lighted and shaded by the orange cloth, the plates were coated with the emulsion, and by the time the last was coated the first was ready to be thoroughly dried by being held over the sheet of iron, that was heated by the lamp. Presto! you saw (oh, yes! there was plenty of light to see by)—you saw a little wave cross the film evenly, and the plate was ready to go into the holder. When exposures had been made during the day the development was carried out that evening if it was convenient; if not, *à demain soir!* An eighty-grain solution of carbonate of ammonia, and the pyro? Ah! that depended on the subject and how much brains one possessed. Anyway, the solution was swept over the plate and the image watched carefully; then the fixing followed by the slight washing; and the bloom that that man managed to get on his negatives! Those soft, exquisite, purple-brown negatives, with the perfect balance of sky and foreground, with clouds in the sky, if there chanced to be any, and the mass of detail in the heavy foliage or dark Italian porticoes close before you in the picture. They were pictures—"If you get six, or, at most, eight really good negatives in one day, you're awfully lucky!" he would say to me; and I, if I obtained one as fine as the average of his, I would be happy for a whole week afterward. There were no yellow screens then, or any orthochromatic plates in those days, and the dry-plates called for a long exposure, yet we—I mean *he*—caught the clouds in the sky just the same, and the good detail in the shadows. This is how he did it: first, the sky-line was carefully noted, then a cardboard ring was made to fit the outer flange of the lens



Union Photo-Engraving Co.

EDNA WALLACE.
BY MORRISON.

mount; a sheet of cardboard was blackened and had one edge cut into saw teeth about one-eighth of an inch deep, and was pinned to the cardboard ring across the opening of the lens, so as to cut off the sky on the field. No regular lens cap was used, but the focusing cloth was thrown over the camera, its end raised for the exposure of the foreground, say, two minutes, then the cloth was lowered again, the cardboard mask removed, and ten or fifteen seconds were given to the sky.

Of course, wet-platism received its deathblow after that, as far as I was concerned, and I also learned that perfectly white skies were not extremely artistic. I remember the chagrin with which I then looked back to a formula I had recommended in *The British Journal of Photography* only a short time before, for blackening out the skies of negatives: An ounce of water, a drachm of liquid ammonia, to dissolve a quantity of shellac, and add lampblack to make a thick paint. A very good formula this was when negatives had to be printed under the hot sun of Southern Italy, but a very good thing applied to a most execrable use—the blackening out of skies. I was punished for it, too, because "Free Lance," an unknown freebooter of a critic, who wielded an awfully cutting pen in the same journal, referred to it as an impossible formula: "You might just as well," he wrote, "pop a lump of sugar in your tea and instantly drink it up for all the good that the shellac will do if dissolved (*sic.*) in water."

In the footsteps of Mr. Woodbury came Mr. Pringle, with Wratten and Wainwright dry gelatine plates and simply took Naples, and Sorrento, and Vesuvius, and Pompeii home with him, having caught the *lazaroni* with uplifted stick in the very act of belaboring the little donkeys which carried the pointed panniers across their shoulders, and the lateen sails speeding the black fisher boats over the white crests of the blue Mediterranean, and the fleecy tufts of delicate smoke that rose from the mountain that ever complains of the eternal fires within.

But for me, an unworthy follower of these two, was left the honor of photographing the interior of the Milan Cathedral; something that had never been done before as a whole.

On a brilliant summer morning I, with my camera and a couple of eight by five of the quickest plates I could obtain through the kindness of Mr. Woodbury, mounted to the inside balcony, right over the central door, and focused a single beam of sunlight that came in through a window behind the arches of the roof, and that fell slantwise to the floor, illumining a white marble holy-water fount midway to the grand altar. The exposure was a long one—so long that the sacristan eventually reproved me for causing the light of day to sacrilegeously enter the holy edifice for such a time ; but the good negative that I obtained was a full recompense to me. In those days such an accomplishment was a feat.

## THE PIN-HOLE IMAGE THEORY IN SCREEN PROCESS PHOTOGRAPHY.

BY FREDERIC E. IVES.



A. W. Stanley.

CERTAINLY for eight years the writer has been teaching his pupils in half-tone block process that each aperture of his cross-line sealed screen might be regarded as a "pin-hole lens," forming a vignetted image of the lens diaphragm, and was also, he believes, the first to publish this idea, in a paper read at the Camera Club, in London, March 8, 1884.

Emphasis was placed upon the statement of fact that, in order to obtain the best images of the lens aperture, with the least disturbance from diffraction, the screen must be held at a certain distance from the sensitive plate, this distance varying according to the character of the screen.

This theory has been generally accepted at the date of this writing, and it is perfectly true that, under the conditions stated, vignetted images of the diaphragm aperture are produced, and diffraction is not a seriously disturbing element

in the calculations for controlling the gradations of light and shade in the negative.

Nevertheless, it is a mistake to assume that the screen aperture produces an ordinary pin-hole image at such a short distance as that at which the sensitive plate is placed, for it does not. The writer's first knowledge of this fact was communicated to him by Mr. Max Levy, who not only suspected the truth, but proved it by a series of ingenious experiments, recording the results by photo-micrography.

These results will have been fully published some time before THE TIMES ANNUAL is due, and one of the objects of this communication is to give some references bearing upon the subject, which the writer has just found, and to make some further observations, all of which may be regarded as merely supplementary to Mr. Levy's publication.

In Stokes' "On Light,"* pp. 46–70, is presented, without mathematics, and, therefore, comprehensible by everybody, a clear statement of all that part of the theory of diffraction necessary to an understanding of what takes place when the light rays pass through the screen aperture. All of it should be read, but a single paragraph explains one of the most interesting facts, viz., that at one screen distance the "pin-hole image" of a small circular diaphragm aperture (giving approximately parallel rays) appears smaller and brighter than the screen aperture itself, while at other distances it becomes diffuse or its centre even darkened. This paragraph (pp. 68, 69) reads as follows:

"Reverting to the case in which light from a luminous point passes through a circular aperture, and is received on a screen beyond, consider the brightness at a point just in the axis on the receiving screen. If the relation between the two distances, already so often mentioned, and the diameter of the hole be such that the sum of the distances from the luminous point to the edge of the hole and from thence to the central point on the receiving screen exceeds the direct distance from the luminous point to the latter by just half a wave's length, theory shows that the illumination is actually four times as great as if the screen in which the hole is

* Macmillan & Co., London, 1887.

pierced were taken away altogether. Suppose, now, the hole be enlarged. We might have said at first sight, supposing we were ignorant of the theory, 'Of course, that must increase the illumination at the central point, or, at any rate, cannot diminish it.' On the contrary, it does diminish it; and if the hole be enlarged till its area is just double what it was in the first instance, the centre of the illuminated space on the screen is a black spot. This theoretical result is easily realized in experiment; only as the wave-length varies from color to color, and the proper distance of the receiving screen varies with the wave-length, when the screen is in adjustment for the brightest part of the spectrum it is not quite in adjustment for the fainter ends, so that the spot instead of being perfectly black is faintly purple."

It has been the writer's practice to expose for the shadows with a small circular diaphragm aperture, the screen distance being such as to give the smallest and brightest image of this aperture upon the sensitive plate, and to expose for the high lights with a diaphragm aperture of several times greater diameter. In this way a sharp, fine dot is always obtained in the shadows, even when the high lights have to be closed up by a supplementary exposure with a large diaphragm aperture.

It is evident, then, that although the modern screen process was brought to its present degree of perfection on the basis of the pin-hole image theory (a good working hypothesis), diffraction really plays an important part, actually improving the "pin-hole image," or injuring or almost destroying it, as the conditions are made favorable or unfavorable.



A STERN VIEW. WALTER BLACKBURN.

# AN IMPROVEMENT IN HALF-TONE.

BY MAX LEVY.



Trout Brook. C. G. Ross.

PHOTO-ENGRAVING and the half-tone plate has in the last few years attained to a high degree of perfection in the results accomplished. Indeed from some originals, and in other cases, with the addition of judicious aid of a skillful retoucher, results have been attained which are all that could possibly be desired.

There are those who insist that the result is not photo-engraving, if any assistance be rendered by hand-work, and that in such an event it is not *strictly* process. This is partially true, but what matter, it is *results* we are after, and as long as these are obtained with an amount of hand labor that keeps the price within commercial limits it is all that can be asked.

The half-tone process is a means to an end, of itself it is insufficient to the end desired, and a true half-tone reproduction will, I believe, always be best obtained by not relying entirely on the mechanical means, but assisting these with some hand-work, either in the shape of re-etching or engraving, or both.

Undoubtedly the greatest weakness of the half-tone process lies in the fact that the surface or print is composed of elements whose relation to each other have no reference to the form or texture of the subject to be reproduced, and this is inherent in the nature of the case.



Engraved by Max Levy.

See Article "An Improvement in Half-tone."

## A BYZANTINE MADONNA.

By W. FUCHS.

The second weakness lies in the fact that all the elements of the subdivided printing surface are the same distance apart, and all the stipples and dots are alike, so that the possible variety of tones is limited, and the rendering of small detail is also restricted to a certain relation between the detail and the texture of the screen.

It was with a view to mitigating the evils growing out of this last set of conditions that I proposed to myself some years ago to work out modified forms of screens.

The first line of attack was naturally the irregular grained screen. I found it easy enough to produce an almost endless variety of grained screens, but none of these would yield a satisfactory printing plate.

The next attempt was to produce a screen formed of alternately thick and thin lines, and crossing this by a similar ruling; the next step was to so space the lines of both sets that the white spaces as well as the black lines should alternate in thickness. These results at once showed a gain over the plain screen in respect to detail as well as modulation of tone in the resulting prints. It was found, however, that the larger and smaller elements grouped themselves in parallel lines in the two directions of the rulings, producing a plaid effect, and the plaid effect could only be reduced by reducing the difference between the alternate lines and spaces, then in order to soften out the plaid effect it was necessary to make the lines so nearly alike that the benefit to be derived from the difference in the lines was practically lost. Finally came the idea of crossing similar crossed screens at an angle of 45 deg., and this has offered thus far the only practical solution of this part of our problem.

This screen consists of a plate ruled with two sets of lines at right angles to each other, and another plate ruled also with two sets of lines at right angles to each other, but at an angle of 45 deg. to the first two, and the spacing so adjusted that the crossings of the one screen coincide with those of the other, *i.e.*, the spacings of the two plates are related to each other as $1 : \sqrt{2}$, and this relation must be accurately maintained. The diagram below shows the screen. An inspection of the diagram will show two different

size points calculated to form black printing dots; these are respectively the points where two lines cross, and those when all four of the lines cross. Similiarly, it will be seen that these intersecting lines leave four different size apertures, in each group, but the larger and smaller one of each pair run together in the negative, and this running together is proportional to the differences in their size, so that a very slight displacement of the two plates upon each other makes a change in the character of the resulting negative. This screen does yield sharper detail than the plain cross-lined screen; it also yields better color, and without re-etching yields a possible increase of gradation of shade or tone value in the proportion of about 4 to 1 as compared to a plain cross-lined screen; lastly, and rather unexpectedly, it is found to be easier to obtain negatives with this new screen.

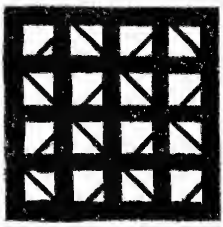


FIG. 1.

I have found in experimenting with these new screens that a good result was attained under a range of varying conditions which led to material differences when the plain screen was employed.

It still remains to be seen whether the advance obtained justifies the extraordinary difficulty of producing the screen, and its great cost, but the task set before me was the accomplishment of the result, and this end having been attained, the solution of the problem of commercial availability will be left to those whose place it is to use screens in their daily business.

I am at least satisfied of one thing, and that is that the present principle of screen formation satisfies the highest theoretical conditions of the problem, and if the mechanical part of half-tone is to be further improved it must be in some other direction than with the aid of a screen. I will only add that the illustration opposite page 227, "A Byzantine Madonna," was produced by the aid of one of the new screens.

## "MISS JERRY"; THE FIRST PICTURE PLAY.

BY ALEXANDER BLACK.

IN a lecture on "Photography in Its Relations to Art," which I gave some years ago before the students of the National Academy, and afterward before a number of photographic societies, I tried to point out certain considerations associated with the fact that fundamentally photography is a science and not an art. I remember that certain connoisseurs in photography were somewhat shocked by the suggestion that various photographs illustrating famous poems represented distinctly divided artistic and scientific



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SCENE FROM "MISS JERRY."

functions; that, strictly speaking, such photographs were simply scientifically obtained reflections of artistic tableaux.

I have found no occasion to modify their opinion, after having undertaken a very considerable labor in the direction of story-telling by the aid of photography. Perhaps I may be permitted to quote a passage in my article published in *Scribner's Magazine:* "Primarily my purpose was to illus-

trate art with life. Five or six years ago, when my plan first was made, I discovered several instances in which photographs from life were used to illustrate fiction, and many other instances in which fiction evidently had been adjusted to photographs from life. Neither of these phases offered any praetieal hint toward the picture play. The suggestion definitely came through a group of photographic studies from living characters, which were tossed together in a 'picture talk' that I called 'Ourselves as Others See Us.' After outlining a eombination of fiction and photography, each devised with a regard for the demands and limitations of the other, it began to be quite clear that the pictures must do more than illustrate. Thus there would be two points of radical difference from the illustrator's scheme. In the first place, the pictures would be primary, the text secondary. Again, the pictures would not be art at all in the illustrators' sense, but simply the art of the *tableau vivant* plus the science of photography. If it is the function of art to translate nature, it is the privilege of photography to transmit nature. But in this case the *tableaux vivants* must be progressive, that the effect of reality may arise no from the suspended action of isolated pictures, but from the blending of many. Here the stereopticon eame to my aid. By carefully registering the backgrounds of the successive pictures in a scene, the figures alone are made to appear to move, thus slowly producing the effect which Mr. Edison has wrought, in a different way, with his kinetoscope."

In other words, the art of such a tableau photograph has expressed itself before the exposer of the camera has been touched. What follows is strictly scientific—the more definitely scientific, the more certain the results. Every *effect*, every *idea*, should be expressed in that which is preliminary to the exposing of the plate; and that all of this is separable from photography is illustrated by the fact that the tableau thus formed is artistically complete in itself. The photograph simply transmits the work. What the painter does is, of course, very different. He does not create such a tableau before painting it. To a certain extent he will seek to find the actual elements in accessories, lighting, etc., before



Copyrighted, 1895. By Alexander Black

Scene from Alexander Black's picture play,

"MISS JERRY."

*Frontispiece to "Miss Jerry,"*

*Published by Charles Scribner's Sons.*



Copyright, 1895, By Alexander Black.

SCENE FROM "MISS JERRY."

beginning his work. But his picture is created on the canvas. There is no non-autographic medium between himself and the thing he creates.

In "Miss Jerry" I have tried the experiment of telling a story with pictures, and of presenting the elements untold by the pictures in spoken text. This method naturally brought up difficulties differing greatly from those met with in the direct illustrating of text. In my second picture play, now in progress of making, I hope to overcome more successfully certain of these obstacles. There does not appear to be any reason for either increasing or diminishing the duration of each picture on the screen. In the course of an hour and a half I shall use about 250 pictures; that is to say, I shall dissolve one into another at the rate of about three to the minute. Important changes will, however, be made in other directions.



Dominion Engraving Co.

LANDSCAPE.
BY SEYMOUR CONWAY.

# A REVIEW OF THE YEAR.



Copyright, 1895, by E. M. Bain.
"A GOOD SAMARITAN."

BUT few important photographic discoveries or inventions can be chronicled in this review of the year that has passed—a year, let us hope, that marked the dawn of better times. Although the science of photography has advanced but a very little during the past twelve months, we must not overlook the important discoveries in other sciences, for while they may not at present have any direct influence upon our art-science, yet they may be the germs of some valuable photographic discoveries in the future. Take, for instance, the discovery of the two new elements, Argon and Helium, by Lord Rayleigh and Professor Ramsey. It was always supposed that our atmosphere contained about seventy-nine parts of nitrogen and twenty-one parts of oxygen. Messrs. Rayleigh & Ramsey noticed that the nitrogen extracted from the atmosphere had not the same density as that obtained from such substances as nitric acid or ammonia. This led to a close investigation and the discovery of a new gas to which the name Argon was given. It is two and a half times as soluble as nitrogen and nearly as soluble as oxygen. Its spectrum differs from all other known gases. Several other substances which we have hitherto regarded as elements are liable to be found to be compound bodies. Even oxygen is suspected. The science of chemistry is advancing, and with it photography must also advance.

Among the other interesting chemical discoveries which are likely to have some influence upon the future of photography may be mentioned the process of manufacturing calcium carbide on a large scale. It is from this substance when brought into contact with water that acetylene gas is produced. This gas burns with a beautiful white flame, and what is still more important to photographers is that, although visually the same, its actinic value is nearly three times that of ordinary coal gas.

Unfortunately, as yet no very successful method of employing it has been discovered. Amateurs who intend experimenting with this substance should be warned that it is poisonous and liable to explode when mixed with air. Dr. W. D. Hoeffken, writing in *The Popular Science News*, claims for this substance a very important future in other ways. He says:

"Acetylene gas is one of the few substances that can be prepared by the direct union of its constituent elements; moreover, it takes up two atoms of hydrogen to form ethylene; and from this body alcohol is produced by the chemical addition of water. Should, therefore, a feasible and cheap process be discovered for the manufacture of ordinary alcohol from acetylene gas, the value of the latter would be incalculable for from alcohol is manufactured an infinite number of substances essential to the practice of medicine and pharmacy, and invaluable as regards scientific research and various technical purposes.

"Acetylene, moreover, will not only play an important part in the aliatphic, but also in the aromatic, series of organic chemistry; for benzene (benzole), the nucleus or starting-point of all the compounds belonging to the aromatic series, has been made from this body. Now, since benzene forms the foundation of all the aniline dyes, the value of acetylene, in this connection, will be readily appreciated."

Among the many interesting experiments that have been described by our scientists perhaps the most valuable, from a photographic point of view, are the researches at extremely low temperatures made by Professor Dewar. He discovered that nearly all solid bodies at the temperature of —200 deg. C., if exposed to the light and then viewed in the dark, appeared phosphorescent. At this temperature all chemical action ceased and chloride of silver remained unaltered by the light. Another important discovery was that, notwithstanding these facts, a photographic dry-plate could still be made to receive a latent image although the speed of the emulsion was considerably reduced. Captain Abney estimates, taking the speed of a plate, under ordinary circumstances, at 100, it was reduced to 25 at a temperature of boiling air, from which he inferred that if it were possible to arrive at the absolute zero (—273 deg. C.) the molecules of bromide of silver would not be acted upon at all, and no latent image could be impressed upon the plate.

We are still looking forward to the discovery of a practical process of making photographs reproducing all the colors of nature, but we fear that we are still as far off as ever. The Lippmann process of interference-color photography, even with the improvements afterwards made by MM. Lumiere, has not proved very successful. To turn this imperfect and unreliable method into a practical one might almost be regarded as a hopeless task. More interest has centered upon the various methods of triple heliochromy. In another part of this book will be found an interesting example of this process. Thanks to the invaluable researches of Ives, Vogel, Kurz and others, it is now quite possible to obtain three negatives of an original colored object, each negative reproducing the various proportions of one of the three fundamental colors, and by combining these three colors by the half-tone, or other photo-mechanical process, to obtain a colored image very similar to the original object photographed. There are, however, still many serious drawbacks to the process which we have every reason to believe will soon be overcome. Quite a number of experimenters are now in the field, and very creditable work is being turned out by some of our leading photo-engravers. It is satisfactory to note that this country is, undoubtedly, far ahead of any other in this class of work.

The latest method of triple heliochromy is that devised by Professor Joly in England. By his method only one plate is necessary to reproduce any combination of colors. The photograph is taken in the ordinary way with an isochromatic plate, the only difference being that a plate, finely ruled in the three primary colors (red green and blue), is placed in front of the sensitive plate, This plate, when removed to some little distance from the eye so that the colored lines are not separately seen, appears of a uniform gray color. Thus, three images corresponding to the three colors are obtained in one plate. A transparency is made from this negative, and a plate ruled in colors slightly different to the one previously used in taking the photograph is placed, properly registered, in front of the positive, and the slide is placed in the lantern. The colors are thus reeombined, and a chromatic image somewhat resembling the original object is obtained.

Since the introduction of the fish-glue enamel process and perfect ruled line screens the half-tone process has made rapid strides, especi-

ally in America. Improvement is also noticeable in the work done in other countries, although we are of opinion that much of the inferior work noticeable is due more to the ignorance of the printer than to the engraver of the plate. American printers have, undoubtedly, become remarkably skillful in the manipulation of the half-tone printing block. One has only to contrast the photo-engravings made years ago with, say, the beautiful half-tone work by the Photochrome Engraving Co. We refer to the child study picture, by Falk, which appears as a frontispiece to THE ANNUAL. Max Levy has invented and patented a new line screen for photo-engravers which is stated to be on a system far superior to the old method. He gives some account of it and a specimen of the work made through it in another part of this volume.

Professional photographers do not appear to have made any great advances in their work. Here and there we find one or two who have adopted the platinotype and carbon processes of printing for those of their patrons who possess artistic taste; otherwise there is a regrettable sameness.

Amateur photography has also remained practically at a standstill. There are certainly a few who have struck out for freedom from conventionalities, and who have been remarkably successful, receiving medals and awards at the different high-class foreign exhibitions held in London, Paris and Vienna, but the majority of the work turned out is still capable of considerable improvement.

The demand for the aristotype papers is still very great, the popular favorite being the Ilotype collodion paper. Still we cannot deny that there is unmistakable evidence of the gradual return to the old stand-by, albumen, this being, in all probability, due to the many inferior and worthless gelatine and collodion papers that have been placed on the market.

The price of dry plates has been considerably reduced since last year, but we do not notice any change in the quality, which still remains all that could be desired. The newest comer is the Three Shields plate, which possesses some remarkable qualities. It is extremely rapid, and is evidently made with the greatest care. Although only recently placed upon the market, it has already become the favorite with both amateur and professional photographers.

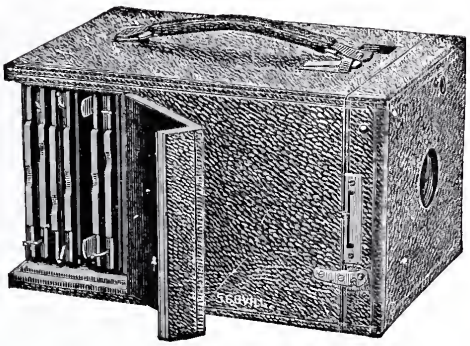
Astronomical photography continues to make rapid strides. In the limited space at our command we are unable to give any lengthy review of the recent developments, but would rather refer our readers to the admirable article upon the subject written for THE PHOTOGRAPHIC TIMES by Prof. Barnard, the eminent astronomer, and which appeared in the March, '95, issue of that publication.

During the year many important books have been published, a list of which will be found on another page.

With the commencement of 1895, THE PHOTOGRAPHIC TIMES was converted into a high-class monthly artistic and scientific magazine, and the successful result of the change is shown in its ever-increasing popularity. Each issue contains a magnificent photogravure frontispiece from photographs by the most distinguished artist-photographers of the world, and a number of interesting and instructive original articles. The magazine is illustrated throughout—sometimes with nearly a hundred reproductions. No trouble or expense is spared in its production, and the publishers are gratified to find it universally aeknowledged the leading photographic magazine of the world.

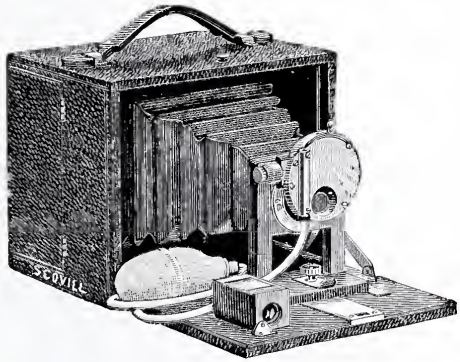
With regard to photographic apparatus several important improvements have been made in the manufacture of cameras. Ever alive to the importance of being up-to-date, the Scovill & Adams Co. of New

York have brought out quite a number of new instruments, some of which we will mention here. Their well-known series of Waterbury cameras has been enlarged by the addition of the new Waterbury, a cut of which is shown. This little instrument is designed for the benefit of those who have suffered from the recent depression in trade, and who are unable to afford the price charged for the ordinary Waterbury Camera. Some idea of the instrument is conveyed by the cut, but we may mention that notwithstanding the fact that it is sold for but $15, it is fitted with a specially rapid single achromatic lens, time and instantaneous shutter, carefully adjusted focusing scale and everything that is contained in a first-class instrument.



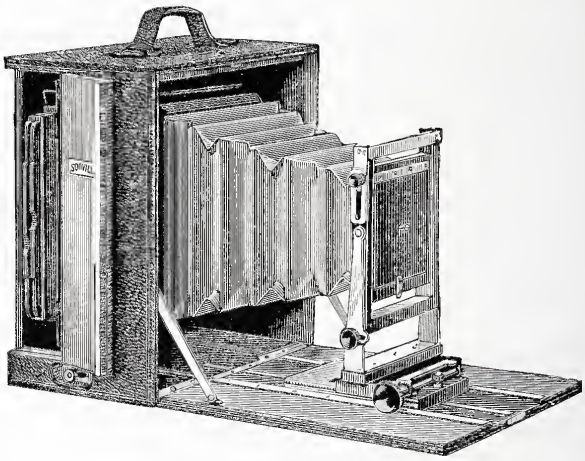
THE NEW WATERBURY.

To supply the growing demand for cheaper instruments the series of Henry Clay Cameras, manufactured by the same firm, has also been extended. The "Henry Clay Second" is not unlike the popular favorite, "The Henry Clay," and while its finish may not be so attractive, yet one must consider the fact that it is sold for the same price as the new waterbury camera, *i.e.*, $15. It is fitted with all the latest devices, achromatic lens, conical bellows, time and instantaneous shutter with pneumatic release, rotary diaphragms and rising and swinging front. The Scovill & Adams Co. certainly deserve considerable praise for their enterprise. To manufacture such instruments as these at a price placing them within the reach of the smallest wage-earner requires the erection of special and costly machinery. Not satisfied with these two successes the same firm has introduced a still further novelty in the shape of a camera combining the best features of the "Henry Clay" and the "Irving" Cameras. For this reason it has been named "The Irving Clay." Some idea of its appearance may be gathered from the accompanying illustration. It is made of thin spruce, covered with leather, is extremely light and portable, and is the only hand and tripod camera with a reversble self-adjusting swing-back.

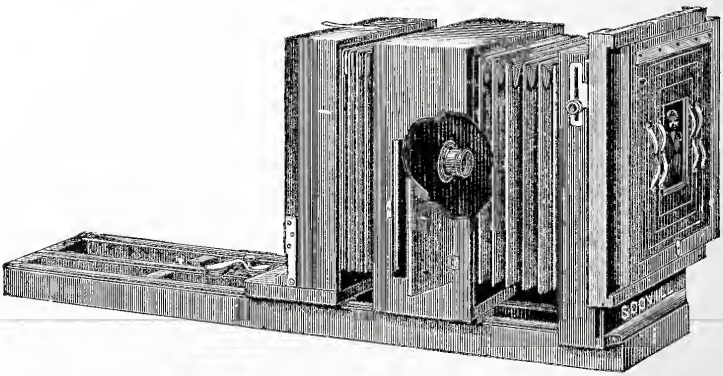



HENRY CLAY SECOND.

The American Optical Company are now making their enlarging, reducing and copying cameras with rising and sliding front. This is an improvement that will be greatly appreciated by photo-engravers, who, on account of special features in design and construction, have been using almost exclusively the cameras manufactured by this company. The addition of the rising and sliding front is undoubtedly of great value, as it does away with the trouble of adjusting the copy, by sliding or raising the copyboard; which, being at a distance from the lens, cannot be brought under proper control without first doing a great deal of guess work. The above is a good illustration of the camera to which we refer.



THE IMPROVED IRVING-CLAY.

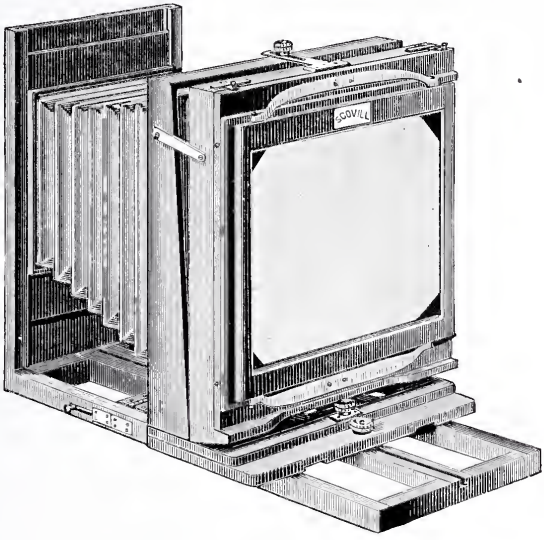


AMERICAN OPTICAL CO.'S IMPROVED ENLARGING AND REDUCING CAMERA.

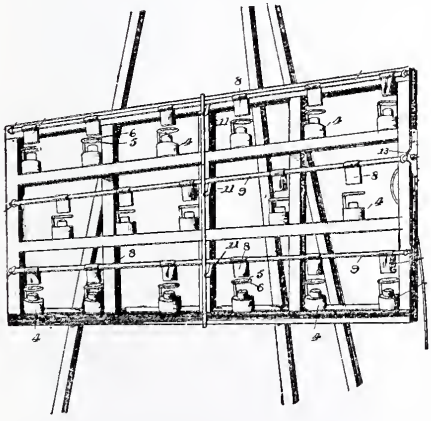
Another new camera, manufactured by the same firm, is that known as "The Reversible Landscape." It has been designed to meet the demand for high-grade apparatus at popular prices; it contains all the

latest improvements, with a specially constructed arrangement by which the back can be constantly reversed.

Another machine giving equally good results is that known as the "Clifford Flash-Light Machine." It is made entirely of metal and possesses three rows of six burners, having a spread of over 6 feet. This, it need hardly be said, is a great advantage in flash-lightwork. In many machines the light is so concentrated as to give hard, unnatural effects with harsh contrasts. By spreading the illuminating surface in this manner we get a diffused effect which results in a soft picture with harmonious lightings.




"THE REVERSIBLE LANDSCAPE."



THE CLIFFORD FLASH-LIGHT MACHINE.

Another advantage of this machine lies in the method of burning the powder. Practically, any quantity of powder can be burnt, so that when a very bright light is desirable it is only necessary to increase the quantity, with the knowledge that the whole will be burnt in the flash. There are few, if any, machines that answer this requirement satisfactorily. Alcohol is used for the flame, so that no gas connections are necessary.

With an instrument of this kind a photographer with any brains can duplicate practically any kind of daylight work. The lights can be raised or lowered, as the machine is portable and can be moved about to any position. With a given

quantity of powder the exposure question need not worry the operator, and few failures need be made.

It is evident that as photo-engraving progresses in the way of perfection in the means employed to obtain the best results, it is necessary that the improvement in the apparatus and the accessories should keep the same pace, for this branch of the photogragphic art being mainly mechanical, depends largely for its success on the tools used. It is gratifying, therefore, to note the systematic manner in which the Scovill & Adams Co. have undertaken to meet the requirements in photo-engraving appliances.

Ever since the introduction of flash-light compounds, attempts have been made to employ them in photographic studios to supply an illumination which should take the place of our solar orb, after that useful functionary had retired to rest. Such attempts were more or less satisfactory—chiefly less. The greatest difficulty that had to be contended with was the apparent impossibility of obtaining an even illumination. The results were invariably so harsh and chalky in appearance as to be useless. The high-lights received too much illumination, and heavy shadows were produced usually without detail.

The necessity for spreading the light became at once evident, and many minds went to work to think out a suitable method. Of the results we have seen we think one of the best to be the arrangement devised by Messrs. Hunter Bros. It is but three feet square, but is provided with a suitable head screen, which has the effect of giving the same distribution of illumination that would be given by a machine six feet square. By the use of this screen the light is beautifully softened, and the results that we have seen are equal and in some instances superior to anything made by daylight.



SCENE IN PRINCE PRO-TEM TAKEN AT THE BOSTON MUSEUM THEATRE BY THE HUNTER FLASH-LIGHT APPARATUS.

The system which has been adopted of igniting the powder is one that will result in the greatest possible illumination with the least quantity of powder. Nothing is wasted. The powder is thrown into the flame by the upward stroke of the hammer.

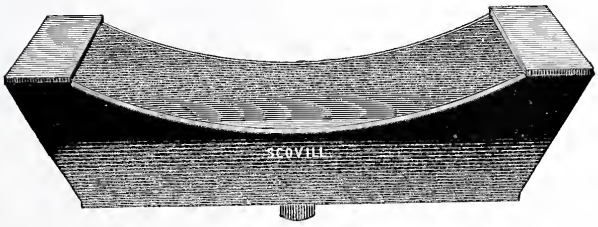
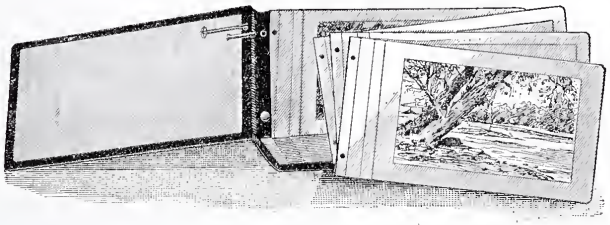



PHOTO-ENGRAVERS' ETCHING TUB.

Following their adjustable screen plate-holder at present universally in use, they have placed on the market an etching tub that we think will fill a long-felt want in the photo-engraving trade. It is very strongly constructed and coated with a substance which will resist the strongest acids.

A handy photograph album possessing many novel features has been devised by Mr. Felix Reifschneider. It is constructed in such a



THE REGENT ALBUM.

manner as to allow the leaves to be readily removed and replaced with little or no trouble and in the twinkling of a moment.

The leaves of The Regent Album are fastened by means of small brass tubes, through which are passed metal fasteners. They lie absolutely flat and are perfectly rigid in the back.

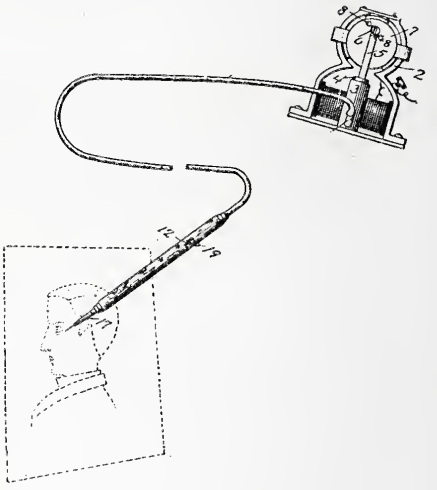
A novel form of retouching machine has been devised by Mr. Arthur E. Peck. It gives to the pencil a vibrating motion which, for retouching, is said to be far superior to the stippling performed by hand.

We hail with delight the advent of a really good mounting paste, called Carter's Photo Library Paste. This product embodies the latest results of advanced chemical research in the department of adhesives, and will be found highly useful and satisfactory in serving

the ends of a home and business paste. Absolute smoothness and uniformity of texture, with entire freedom from lumps or granular inequality of any kind, enable the user to mount photographs and other valuable papers without danger of warping or cockling. The paste, moreover, is quick in action, of great adhesive force, and will not discolor or injure in any way the objects to which it is applied.

This pastehas a beautiful white color (bespeaking its purity and chemical perfection), and it is delightfully perfumed. It is always ready for use, and requires no heating or special conditions of any kind. It will keep in any climate.

Since the introduction of the Jena glass many important improvements have been made in the manufacture of lenses, possessing considerable flatness of field and freedom from astigmatism.



PECK'S RETOUCHING MACHINE.

Messrs. Carl Zeiss of Jena have constructed a new and very rapid lens termed the Satz-Astigmat. This may be said to be the very best and latest of these lenses. Its action is simply remarkable.



BY DR. J. A. BOOTH.



Copyright, 1895, By Dexter Thurber.

The Coloritype Co., N. Y.

"IN DAISY TIME."

By DEXTER THURBER.

# STANDARD FORMULAE
AND
# USEFUL RECIPES.

## THE WET COLLODION PROCESS.

**1.**—NEGATIVE COLLODION.

| | |
|---|---|
| Ether | ¼ fluid ounce |
| Absolute alcohol | ½ fluid ounce |
| Pyroxyline | 5 gr. |
| Iodide of ammonium | 5 gr. |
| Bromide of cadmium | 2 gr. |

**2.**—FERROTYPE COLLODION (ESTABROOKE'S).

| | |
|---|---|
| Iodide of ammonium | 30 gr. |
| Iodide of sodium | 10 gr. |
| Iodide of cadmium | 20 gr. |
| Bromide of cadmium | 20 gr. |
| Ether and alcohol (of each) | 5 ounces |
| Pyroxyline, sufficient quantity, say | 25 gr. |

**3.**—COLLODION FOR THE REPRODUCTION OF LINE WORK (VOLKMER'S).

*Plain Collodion.*

| | |
|---|---|
| Ether | 700 C.c. |
| Alcohol | 490 C.c. |
| Pyroxyline | 16 Gm. |

*Sensitizer.*

| | |
|---|---|
| Chloride of calcium | 1.6 Gm. |
| Iodide of ammonium | 4.7 Gm. |
| Iodide of cadmium | 7.8 Gm. |
| Absolute alcohol | 123 C.c. |

After being perfectly dissolved, mix.

**4.**—ENAMEL COLLODION.

| | |
|---|---|
| Alcohol (.82) | 48 ounces |
| Ether (.72) | 84 ounces |
| Pyroxyline | 1 ounce |
| Castor oil | 10 minims |

**5.**—SILVER BATH FOR WET-PLATES.

| | |
|---|---|
| Nitrate of silver | 1 ounce |
| Distilled water | 10 ounces |

Iodize and acidulate with nitric acid.

**6.**—SILVER BATH FOR FERROTYPES (ESTABROOKE'S).

| | |
|---|---|
| Nitrate of silver | 4 ounces |
| Water | 64 ounces |
| Iodide potassium | 2 gr. |

Dissolve, sun for three or four hours, filter and acidulate.

**7.**—DEVELOPER FOR FERROTYPES, BY E. P. GRISHOLD.

| | |
|---|---|
| Protosulphate of iron and ammonia | 4 ounces |
| Water | 64 ounces |
| Acetic acid, 1.048 (U. S. Ph.) | 4 ounces |
| Yellow rock candy | ½ ounce |

**8.**—DEVELOPER FOR WET-PLATES.

| | |
|---|---|
| Sulphate of iron and ammonia | 1 ounce |
| Acetic acid, 1.048 (U. S. Ph.) | 1½ ounces |
| Water | 16 ounces |

**9.**—DEVELOPER FOR HARD NEGATIVES (LINE WORK) WET-PLATES.

| | |
|---|---|
| Protosulphate of iron | 5 Gm. |
| Water | 100 C.c. |
| Tartaric acid | 1 Gm. |

**10.**—Developer for Wet-Plates (Very Intense).

| | |
|---|---|
| Protosulphate of iron | 36 Gm. |
| Sulphate of copper | 12 Gm. |
| Water | 1000 C.c. |
| Glacial acetic acid, 85 per cent | 50 C.c. |
| Alcohol | 40 C.c. |

**11.**—Intensifier for Wet-Plates.

| | |
|---|---|
| Saturated solution of protosulphate of iron | 20 C.c. |
| Acetic acid, 1.048 (U. S. Ph.) | 10 C.c. |
| Citric acid | 5 Gm. |
| Water | 200 Gm. |

And silver solution to suit.

**12.**—Intensifier for Wet-Plates.

| | |
|---|---|
| Pyrogallic acid | 1 Gm. |
| Citric acid | 3 Gm. |
| Water | 80 C.c. |

And silver solution to suit.

**13.**—Intensifier for Line Work, Wet-Plates.

| | |
|---|---|
| A.—Bromide of potassium | ½ ounce |
| Water | 4 ounces |
| B.—Sulphate of copper | ½ ounce |
| Water | 4 ounces |

Mix equal parts of A and B, and pour on the film. When perfectly whitened, blacken with solution of nitrate of silver, 30 grains to the ounce.

For greater intensity, use hydrosulphate of ammonia solution, 1 part in 4 parts of water, after the bromide of copper, and thorough washing.

**14.**—Intensifier for Wet-Plates.

| | |
|---|---|
| Red prussiate of potash | 2 drachms |
| Nitrate of lead | 3 drachms |
| Water | 12 ounces |

Immerse the fixed negative till thoroughly whitened; wash, and flood with solution of hydrosulphate of ammonia.

**15.**—To Strip Collodion Negatives.

The best way to do this is to coat the negative, when dry, with a solution of pure rubber in benzole, and afterwards with leather collodion. When perfectly dry, the edges of the negatives may be cut in, and the plate immersed in a diluted acetic acid solution 1:10. After a short time the film loosens, and may easily be detached from the plate, and turned.

**16.**—To Rectify a Negative Silver Bath,

Dissolve 1 part of permanganate of potassium in 100 parts of water, and add drop by drop so much of this solution to the bath impregnated with organic matter, till, after vigorously shaking, a slight pinkish color remains.

Sun for several hours, filter and test for neutrality. Acidify with nitric acid.

## DRY COLLODION PROCESSES.

**17.**—Collodio-Bromide Emulsion.

| | |
|---|---|
| Ether, sp. g. 0.720 | 5 fluid ounces |
| Alcohol, sp. g. 0.820 | 3 fluid ounces |
| Pyroxyline | 50 gr. |
| Bromide of cadmium and ammonium | 80 gr. |
| (or bromide of zinc | 76 gr.) |

Sensitize by adding to each ounce 15 grains of nitrate of silver, dissolved in 1 drachm of boiling alcohol mixed with a few drops of water. This is suitable for slow landscape work or transparencies.

## GELATINE DRY-PLATE PROCESSES.

### 18.—W. K. Burton's Gelatine Emulsion.

A.—Bromide of ammonium ..... 260 gr.
Iodide of potassium ..... 20 gr.
Gelatine (Nelson, No. 1) ..... 80 gr.
Distilled water ..... 10 ounces

B.—Silver nitrate ..... 200 gr.

C.—Silver nitrate ..... 200 gr.
Distilled water ..... 1 ounce

Converted to ammonio-nitrate.

D.—Gelatine, hard (dry) ..... 600 gr.

For detailed directions for making the emulsion, see *Photographic Times*, Vol. XVII., page 285.

### 19.—Henderson's Gelatine Emulsion by Ammonia Method.

Dissolve

Bromide of ammonium ..... 308 gr.
Gelatine ..... 50 gr.

Previously swelled

In distilled water ..... 8½ ounces

When cold, add

Water ..... 1¾ ounces
Alcohol ..... 1¾ ounces
Stronger ammonia (0.900) ..... ½ ounce

Next dissolve by heat

Nitrate of silver ..... 462 gr.
In distilled water ..... 3¾ ounces

and add gradually to the gelatine solution. Ripening for twenty-four hours gives sensitiveness to the emulsion. Add, finally, 220 grains of swelled gelatine.

### 20.—Dr. J. M. Eder's Gelatine Emulsion with Ammonio-Nitrate of Silver.

In distilled water, 10 ounces, dissolve bromide of potassium, 370 grains; add gelatine, 617 grains, previously swelled in water. In distilled water, 10 ounces, dissolve nitrate of silver, 462 grains.

To this solution, cold, add stronger ammonia, drop by drop, until the precipitate first formed is redissolved. Add this gradually to the first solution, and place in a water bath at a temperature of 105 deg. Fahr., for 30 to 45 minutes. Then remove the source of heat, and allow the emulsion to cool down gradually to about 75 deg. Fahr., then pour out to set, and proceed as usual.

### 21.—Gelatino-Bromo-Chloride Emulsion.

Ammonium bromide ..... 65 grains
Ammonium chloride ..... 5 grains
Gelatine ..... 10 grains
Silver nitrate ..... 120 grains
Nitric acid ..... ½ minim
Water ..... 4½ ounces

## DEVELOPMENT OF GELATINE EMULSION PLATES.

**22.**—CARBUTT'S PYRO DEVELOPER.

*No.* 1. *Pyro Stock Solution.*

| | | |
|---|---|---|
| 300 C.c. | Distilled or ice water | 10 ounces |
| 1 Gm. | Oxalic acid | 15 gr. |
| 2 Gm. | Bromide potassium | 30 gr. |

Then add Schering's pyro, 1 ounce (30 grammes), and water to make 16 fluid ounces (480 C.c.).

*No.* 2. *Stock Soda Solution.*

| | | |
|---|---|---|
| 300 C.c. | Water | 10 ounces |
| 60 Gm. | Soda sulphite crystal | 2 ounces |
| 60 Gm. | Soda Carb. Crys. (or dry gran. 1 oz) | 2 ounces |
| 30 Gm. | Potash Carbonate | 1 ounce |

Dissolve, and add water to make measure 16 fluid ounces (480 C.c.).

*No.* 3. *Bromide Solution.*

| | | |
|---|---|---|
| 14 Gm. | Bromide of sodium or potassium | ½ ounce |
| 150 C.c. | Water | 5 ounces |

*Pyro Developer.*—Dilute 2 ounces of stock No. 2 with 7 ounces of water for cold weather, and 10 to 12 of water in summer. To 3 ounces of dilute No. 2 add 1½ to 2½ drachms (6 to 10 C.c.) of No. 1. The more pyro the denser the negative, and *vice versa*. No yellowing or fogging need be apprehended if our directions are followed. Development should be continued until the image seems almost buried, then wash and place in fixing bath.

For instantaneous exposures, take for a 5 x 8 or 6½ x 8½ plate 3 ounces of dilute No. 2. Lay the plate to soak in this, and cover pan. Put 2 drachms of No. 1 into the graduate, and 3 drops of bromide solution. Pour the soda solution off of the plate into the pyro and back over the plate; let development proceed, and examine occasionally. Keep solution in gentle motion over the plate. A *very* short exposure may take ten minutes to fully develop. If the image is not fully brought out this time, add to developer in pan three times its bulk of water, and let plate lie in it covered over half an hour or more if necessary, until full development is attained; then wash, and proceed as directed under head of developer

**23.**—EIKONOGEN AND HYDROCHINON DEVELOPER (FOR CARBUTT'S ORTHOCHROMATIC PLATES, "CELLULOID" FILMS AND TRANSPARENCIES).

| Metric Weight. | A. | Avoirdupois Weight. |
|---|---|---|
| 600 C.c. | Distilled water | 20 ounces |
| 120 Gm. | Sulphite of soda crystals | 4 ounces |
| 22 Gm. | Eikonogen | 330 gr. |
| 10½ Gm. | Hydrochinon | 160 gr. |
| 960 C.c. | Water to make up to | 32 ounces |

| Metric Weight. | B. | Avoirdupois Weight. |
|---|---|---|
| 600 C.c. | Distilled water | 20 ounces |
| 60 Gm. | Carbonate of Potash | 2 ounces |
| 60 Gm. | Carbonate soda crystals | 2 ounces |
| 960 C.c. | Water to make up to | 32 ounces |

*Developer.*—For instantaneous exposures, take (30 C.c.) 1 ounce A, (30 C.c.) 1 ounce B, (120 C.c.) 4 ounces water; for portraits, take (30 C.c.) 1 ounce A, (30 C.c.) 1 ounce B, (150 C c.) 5 ounces water; for landscapes, full exposures, sens. 20-27, take (30 C.c.) 1 ounce A, (15 C.c.) ½ ounce B, (90 C.c.) 3 ounces water; for landscapes, full exposures, sens. 16-20, take

(30 C.c.) 1 ounce A, (25 C.c.) ¾ ounce B, (120 C.c.) 4 ounces water; for lantern slides, full exposures, take (30 C.c.) 1 ounce A, (25 C.c.) ¾ ounce B, (120 C.c.) 4 ounces water, and 2 to 6 drops Restrainer D to each ounce of developer.

NOTE.—More of A will increase density, more of B will increase detail and softness. Temperature of developer should not vary much below 65 degs. nor above 75 degs. The after-treatment is the same as with any other developer.

**24.**—CARBUTT'S NEW ACID FIXING AND CLEARING BATH.

| | | |
|---|---|---|
| 4 C.c. | Sulphuric acid | 1 drachm |
| 480 Gm. | Hyposulphite of soda | 16 ounces |
| 60 Gm. | Sulphite of soda | 2 ounces |
| 30 Gm. | *Chrome alum | 1 ounce |
| 1920 C.c. | Warm water | 64 ounces |

Dissolve the hyposulphite of soda in 48 ounces (1440 C.c.) of water, the sulphite of soda in 6 ounces (180 C.c.) of water, mix the sulphuric acid with 2 ounces (60 C.c.) of water, and pour slowly into the sulphite soda solution, and add to the hyposulphite; then dissolve the chrome alum in 8 ounces (240 C.c.) of water and add to the bulk of solution, and the bath is ready. This fixing bath will not discolor until after long usage, and both clears up the shadows of the negative and hardens the film at the same time.

After negative is cleared of all appearance of silver bromide, wash in running water for not less than half an hour to free from any trace of hypo solution. Swab the surface with wad of wet cotton, rinse, and place in rack to dry spontaneously.

**25.**—CARBUTT'S CLEARING SOLUTION TO REMOVE YELLOW STAIN CAUSED BY DEVELOPER.

| | | |
|---|---|---|
| 600 C.c. | Water | 20 ounces |
| 90 Gm. | Sulphate of iron | 3 ounces |
| 30 C.c. | Sulphuric acid | 1 ounce |
| 30 C.c. | Alum | 1 ounce |

If, after developing and fixing your negative, it is found to be stained yellow from the pyro or hydrochinon developer, first wash well to remove all hyposulphite, then immerse in above solution until the stain is removed; again wash well, and dry.

N. B.—It will improve lantern slides to immerse them for a few minutes in the clearing solution after being well freed from hyposulphite.

**26.**—CARBUTT'S INTENSIFYING SOLUTION.

*Intensification.*—With correct exposure and development, intensification need never be resorted to. The following formula is, however, very effective, and the most permanent of all methods:

*No.* 1.

| | | |
|---|---|---|
| 16 Gm. | Bichlor. mercury | 240 gr. |
| 16 Gm. | Chloride ammonia | 240 gr. |
| 600 C.c. | Distilled water | 20 ounces |

*No.* 2.

| | | |
|---|---|---|
| 16 Gm. | Chloride ammonia | 240 gr. |
| 600 C.c. | Water | 20 ounces |

* N. B.—During cold weather use only half the quantity of chrome alum in above.

*No. 3.—Cyanide-Silver Solution.*

| | | |
|---|---|---|
| 180 C.c. | Distilled water | 6 ounces |
| 4 Gm. | Cyanide potass., C. P. | 60 gr. |
| 60 C.c. | Distilled water | 2 ounces |
| 4 Gm. | Nitrate of silver | 60 gr. |

Pour the silver into the cyanide solution while stirring, and mark bottle *poison.*

Let the plate to be intensified wash for at least half an hour, then lay in a 5 per cent. solution of alum for ten minutes, and again wash thoroughly; this is to insure the perfect elimination of the hypo. The least trace of yellowness after intensifying shows that the washing was not sufficient.

Flow sufficient of No. 1 over the negative to cover it, and allow to either partially or entirely whiten; *the longer it is allowed to act*, the *more intense* will be the result; pour off into the sink, rinse, and flow over No. 2, and allow to act one minute; wash off, and pour over or immerse in No. 3 until changed entirely to a dark brown or black. No. 3 can be returned to its bottle, but Nos. 1 and 2 had better be thrown away. Wash thorougly and dry.

**27.**—Wuestner's Developers for New Eagle Lightning, New Orthochromatic and Imperial Non-Halation Plates.

*Developing Formula.*—These plates can be successfully worked with any good developer. For producing the finest negatives, with shortest possible exposure, we recommend the following "sal soda" developer:

*No. 1. Pyro Stock Solution.*

| | |
|---|---|
| Water | 84 ounces |
| Sulphite soda crystals | 1 pound |
| Pyrogallic acid | 2 ounces |
| Sulphuric acid, C. P. | 10 drops |

*No. 2. Soda Stock Solution.*

| | |
|---|---|
| Water | 84 ounces |
| Sal soda (crystals) | 8 ounces |

*Developer.*—Take 2 ounces of No. 1, and 2 ounces of No. 2, and add 8 ounces of water.

This developer may be used repeatedly as long as it remains clear, but will work slower and with more intensity when old. Therefore the fresh developer is best for short exposures, and the old is better if the plate has been full timed. In using the sal soda developer, *it is very important, to carry the development far enough, until the lights have sufficient intensity when examining the plate by transmitted light.*

Over-exposure is corrected by adding to each ounce of developer from 2 to 4 drops of the following solution: Bromide of ammonium, 1 ounce to 10 ounces of water; or by putting the plate into a weak solution of bromide of ammonium (1 to 50 water), before the development has proceeded too far, and then returning it to the developer, to gain sufficient intensity.

If under-exposure is noticed, take the plate out of developer, and, without draining, put into "soda solution"; sufficient developer will remain in the film to develop the shadows, the lights being prevented from gaining too much density in this way.

**28.**—Wuestner's Eikonogen Developer for Portraits and Landscapes.

No. 1.

| | | |
|---|---|---|
| 2400 C.c. | Distilled or ice water | 80 ounces |
| 115 Gm. | Sulphite of soda (crystals) | 3½ ounces |
| 4 Gm. | Oxalic acid | 1 drachm |
| 75 Gm. | Eikonogen | 2½ ounces |
| 15 Gm. | Yellow prussiate of potash | ½ ounce |

No. 2.

| | | |
|---|---|---|
| 600 C.c. | Distilled or ice water | 20 ounces |
| 60 Gm. | Carbonate of potash | 2 ounces |

*Developer.*—Take 4 ounces of No. 1 and ½ ounce of No. 2.

For instantaneous exposures, we recommend the following eikonogen developer:

Dissolve in

| | | |
|---|---|---|
| 300 C.c. | Distilled or ice water | 10 ounces |
| 20 Gm. | Sulphite of soda crystals | ⅔ ounce |
| 10 Gm. | Carbonate of potash | ⅓ ounce |

And then add

| | | |
|---|---|---|
| 10 Gm. | Eikonogen | ⅓ ounce |

*Fixing Bath.*

| | |
|---|---|
| Water | 100 parts |
| Sulphite soda (crystals) | 5 parts |
| Sulphuric acid, C. P. | 1 part |

And add

| | |
|---|---|
| Hyposulphite of soda | 20 parts |

This fixing bath cannot be excelled; you will always get a clear and brilliant negative, no yellow stains, a good printing color, and the plate will fix in considerable less time.

After fixing, place the negative in a dish containing a 10 per cent. chrome alum solution; let it remain a few minutes to harden the film, then wash thoroughly.

In tropical climates, we recommend putting the plates in the alum solution before fixing.

**29.**—Wuestner's Amidol Developer.

| | | |
|---|---|---|
| 1000 C.c. | Water | 34 ounces |
| 60 Gm. | Sulphite of soda (crystals) | 2 ounces |
| 1 Gm. | Bromide of ammonium | 15 gr. |

Dissolve, and add 4 to 6 grains (from 1 to 1½ drachms) amidol just before using.

For instantaneous exposures, take double the quantity of sulphite of soda (crystals) 120 grammes (4 ounces).

It is advisable to put this developer up in small quantities.

**30.**—Direction for Working the Cramer Plate.

Eikonogen Developer.

No. 1.

| Metric Weights and Measures. | | Engl. Measures, Troy Weight. |
|---|---|---|
| 1200 C.c. | Distilled water { Hydrometer test 15. | 40 ounces |
| 60 Gm. | Sulphite of sodium crystals | 2 ounces |
| 30 Gm. | Eikonogen | 1 ounce |

Boil for a few minutes. After cooling, pour into a bottle and keep it well stoppered.

No. 2.

| | | |
|---|---|---|
| 300 C.c. | Water | 10 ounces |
| 30 Gm. | Carbonate of potassium | 1 ounce |

For Use.

| | | |
|---|---|---|
| 90 C.c. | Solution No. 1 | 3 ounces |
| 30 C.c. | Solution No. 2 | 1 ounce |

In hot weather, dilute with an equal quantity of cold water. This developer can be used repeatedly by occasionally adding more of Solution No. 1 and 2.

To obtain thin negatives, full of detail, such as are required for printing on Aristo Paper, use the developer more diluted.

For negatives of greater density, add to solution No. 1:

| | | |
|---|---|---|
| 4 Gm. | Hydrochinon | 1 drachm |

PYRO DEVELOPER.

*Alkaline Solution.*

| | | |
|---|---|---|
| 1800 C.c. | Water | 60 ounces |
| 150 Gm. | Carbonate of sodium crystals (sal soda) | 5 ounces |
| 300 Gm. | Sulphite of sodium crystals | 10 ounces |

A smaller quantity of sulphite will produce a warmer tone, a larger quantity a gray or bluish-black tone.

The alkaline solution must be kept in well-stoppered bottles.

If the negatives show yellow stain, make a fresh solution, or try another lot of sulphite of sodium.

*Pyro Solution.*

| | | |
|---|---|---|
| 180 C.c. | Distilled or pure ice water | 6 ounces |
| 1 C.c. | Sulphuric acid | 15 minims |
| 4 Gm. | Sulphite of sodium crystals | 1 drachm |
| 30 Gm. | Pyrogallic acid | 1 ounce |

All pyro solutions work best while fresh.

8 grains dry pyro may be substituted for 1 drachm of this solution.

Mix in the following proportions:

| | | |
|---|---|---|
| 10 C.c. | Pyro solution | 1 drachm |
| 80 C.c. | Alkaline solution | 1 ounce |
| 160 C.c. | Tepid water (for winter use) | 2 ounces |
| | or, | |
| 240 to 400 C.c. | Cold water (for summer use) | 3 to 5 ounces |

*Fixing Bath.*—The negatives may be fixed in a plain hypo bath, 1 part hyposulphite of soda to 4 parts of water; but the following bath is especially recommended.

Prepare two solutions.

No. 1.

| | | |
|---|---|---|
| 1 kilo | Hyposulphite of soda | 32 ounces |
| 3 liter | Water | 3 quarts |

No. 2.

| | | |
|---|---|---|
| 1 liter | Water | 1 quart |
| 15 C.c. | Sulphuric acid | ½ ounce |
| 120 Gm. | Sulphite of sodium crystals | 4 ounces |
| 90 Gm. | Chrome alum | 3 ounces |

After the ingredients are dissolved, pour No. 2 solution into No. 1.

During the cold season, one-half the quantity of No. 2 is sufficient.

Cramer's Isochromatic Plates are developed and fixed with the same solutions.

**31.**—POTASH DEVELOPER FOR "HARVARD" DRY-PLATES.

| | | |
|---|---|---|
| A.—Distilled water | | 12 ounces |
| | Sulphite of soda (crystals) | 2 ounces |
| | Citric acid | 60 gr. |
| | Bromide of ammonium | 25 gr. |
| | Phrogallic acid | 1 ounce |

Dissolve separately, mix in order named and filter.

| | | |
|---|---|---|
| B.—Distilled water | | 12 ounces |
| | Sulphite of soda (crystals) | 2 ounces |
| | Carbonate of potash | 4 ounces |

Dissolve separately, mix and filter.

The stock solutions must be kept in well stoppered bottles. The pyro stock solution will remain clear and in good order for about a month. It should not be used after it has turned dark and muddy from age.

To develop, mix A, 1 drachm; B, 1 drachm; water, 2 ounces. For detail, add more water; for contrast, more A; for density, more of each, A and B. For instantaneous or short exposures, use double the quantity of water (4 ounces) to begin with; pour off when about half developed, and finish with developer, full strength.

After development, and before fixing, it is well to flow the negative with a saturate solution of alum. Rinse, and fix in the following solution:

| | |
|---|---|
| Hyposulphite of soda | 1 pound |
| Water | 2 quarts |

Many prefer to add alum to the fixing solution (about 1 ounce to the above), to which there is no serious objection, provided, always, it is filtered occasionally.

THE "SEED" PLATE.

**32.**—PYRO DEVELOPER.

No. 1.

| | |
|---|---|
| Pyrogallic acid | 1 ounce |
| Sulphite of soda (crystals) | 4 ounces |
| Water, distilled or good well water | 16 ounces |

No. 2.

| | |
|---|---|
| Sal soda | 4 ounces |
| Water | 16 ounces |

To develop, take

| | |
|---|---|
| No. 1 | 1 ounce |
| No. 2 | 1 ounce |
| Water | 8 ounces |

In warm weather, use more water; in cold weather, less.

Where Aristo Paper is used, the negative must be much thinner and fuller of detail than is required for albumen paper; therefore, take

| | |
|---|---|
| No. 1 | 1 ounce |
| No. 2 | 1½ ounces |
| Water | 10 ounces |

**33.**—PYRO DEVELOPER BY USE OF HYDROMETER.

Make stock solution of sulphite of soda to test 60 with hydrometer; allow to settle perfectly clear, then take

| | |
|---|---|
| Sulphite of soda solution | 16 ounces |
| Pyro | 1 ounce |
| Sulphuric acid | 10 drops |
| (Or oxalic acid, 10 gr.) | |

No. 2.

Sal soda solution, hydrometer test 40.

To develop, take

| | |
|---|---|
| Water | 8 ounces |
| No. 1 | 1 ounce |
| No. 2 | 1 ounce |

In warm weather, use more water; in cold weather, less.

Where Aristo Paper is used, the negative must be much thinner and fuller of detail than is required for albumen paper; therefore, take

| | |
|---|---|
| No. 1 | 1 ounce |
| No. 2 | 1½ ounces |
| Water | 10 ounces |

**34.**—EIKONOGEN DEVELOPER—NO. I.

No. 1.

| | |
|---|---|
| Sulphite of soda (crystals) | 3 ounces |
| Hot water | 45 ounces |

Thoroughly dissolve, then add

| | |
|---|---|
| Eikonogen | 1 ounce |

No. 2.

| | |
|---|---|
| Sal soda | 4 ounces |
| (Or carb. of potassium, 1¼ ounces.) | |
| Water | 15 ounces |

To develop, take of

| | |
|---|---|
| No. 1 | 3 ounces |
| No. 2 | 1 ounce |

*Fixing Bath.*

| | |
|---|---|
| Alum | ¼ ounce |
| Hyposulphite of soda | 5 ounces |
| Water | 16 ounces |

**35.**—Eikonogen Developer. (In one solution, for instantaneous work.)

| | |
|---|---|
| Eikonogen | 120 grains |
| Crystallized sulphite of sodium | 1½ ounces |

Dissolve in 8 ounces of hot water and add carbonate of potassium 120 grains.

For use, dilute with an equal bulk of water, and add a few drops of a 10 per cent. solution of bromide of potassium.

**36.**—Para-amidophenol Developer.

| | |
|---|---|
| Para-amidophenol hydrochlorate | 150 gr. |
| Sulphite sodium in crystals (Andresen's) | 1½ ounces |
| Potassium carbonate | 1½ drachms |
| Water | 32 ounces |

May be diluted in the proportion of from 1:8 to 1:12.

**37.**—Rodinal.

| | |
|---|---|
| Metabisulphite of potassium | 30 Gm. |
| Para-amidophenol hydrochlorate | 10 Gm. |
| Potassium hydrate | To neutralization |
| Water | 100 Gm. |

This developer permits to be diluted in the proportion of 1:40.

**38.**—Metol Developer (Hauff).

*Solution A.*

| | |
|---|---|
| Water | 100 parts |
| Metol | 1 part |
| Soda sulphite | 10 parts |

*Solution B.*

| | |
|---|---|
| Water | 100 parts |
| Carbonate potash (or substitute) | 10 parts |
| Crystallized carbonate soda | 20 parts |

For use, three parts A to one of B, with 40 minims of bromide of potassium solution (1 : 10).

**39.**—Metol Developer (Andresen).

*One Solution.*

| | |
|---|---|
| Water | 1 quart |
| Metol | ¾ ounce |
| Sulphite of soda | 7 ounces |
| Carbonate of potash | 3½ ounces |
| Bromide of potassium | $\frac{1}{10}$ ounce |

*Two Solution.*

| | |
|---|---|
| A.—Water | 1 quart |
| Metol | ¾ ounce |
| Sulphite of soda | 7 ounces |
| B.—Water | 3 quarts |
| Carbonate of soda | 7 ounces |

Of these, one part of A is mixed with three parts of water for use, bromide of potassium being added as required for the prevention of fogging.

**40.**—Amidol Developer.

Dissolve 10 ounces of neutral sodium sulphite in crystals (Andresen's) in 50 ounces of distilled water, and add 1 ounce of amidol. Dissolve, filter quickly, and fill up in small bottles.

For use, dilute with from 2 to 4 volumes of water.

Do not spare bromide of potassium.

**41.—Dr. Stolze's Amidol Developer.**

A.—Distilled water ..... 100 Gm.
Potassium metabisulphite ..... 25 Gm.
Amidol (Andresen's)..... 5 Gm.

B.—Distilled water ..... 100 Gm.
Potassium bicarbonate ..... 20 Gm.

To 100 C.c. of water add 10 C.c. of A, and of B from 5 to 50 C.c., according to time of exposure. For normal exposures, 20 C.c. are sufficient.

Do not apply the solution till effervescence has ceased.

**42.—Crystallos.**

Sodium sulphite cryst..... 8 ounces
Ferrocyanide potassium..... 2½ ounces
Hydrochinon ..... 1½ ounces
Caustic potash solution (75 per cent)..... 2 ounces
Distilled water..... 28 ounces

Dissolve the first three substances in 20 ounces of water, then add the caustic potash solution, finally the rest of the water. The Paris crystallos is tinted red with aniline dye, which, however, has no influence upon its action.

Dilute the solution with from 1 to 5 and 8 volumes of water.

**43.—Glycin Developer.**

Sodium sulphite..... 40 grains
Glycin..... 20 grains
Potassium carbonate..... 80 grains
Water..... 4 ounces

**44.—Potash Developer for Gelatine Dry-Plates (Dr. Stolze's).**

*Modified by Dr. Eder.*

A.—Carbonate of potassium ..... 90 Gm.
Sulphite of sodium, cryst..... 25 Gm.
Water ..... 200 C.c.

B.—Water..... 100 C.c.
Sulphite of sodium, cryst..... 25 Gm.
Pyrogallol ..... 12 Gm.

Mix 40 minims of A with 50 minims of B and 100 C.c. of water.

Bromide of potassium should be used only in minimal quantities, 1 to 3 minims (of a 10 per cent. solution); with more, the general sensitiveness is much reduced.

An alum bath mixed with an equal volume of saturated sulphate of iron solution increases the density, and gives the plate a good printing quality.

**45.—Soda Developer in One Solution for Gelatine Dry-Plates (Eder's Formula).**

Crystallized sulphite of sodium..... 5 drachms
Carbonate of sodium..... 2½ drachms

Dissolve in 2 ounces of boiled distilled water, and, after having cooled down, add 46 grains of pyro. Keep in well-stoppered bottles, and for use dilute with five times its bulk of water.

**46.—Ferrous-Oxalate Developer for Gelatine Dry-Plates (Dr. Eder's).**

A.—Neutral oxalate potassium..... 200 Gm.
Distilled water ..... 800 C.c.

Acidulate with oxalic acid.

B.—Protosulphate of iron, cryst..... 100 Gm.
Distilled water..... 300 C.c.
Sulphuric acid..... 5 minims

C.—Bromide of potassium..... 10 Gm.
Distilled water..... 100 C.c.
D.—Hyposulphite of sodium..... 2 Gm.
Distilled water..... 200 C.c.

Mix immediately before use 3 volumes of A with 1 volume of B, and develop. Restrain with a few drops of C.

For over-exposure, take less of the iron solution and add gradually in small portions, as required. To give the negative body, use C.

To make soft negatives with fine detail, take of

A..... 250 C.c.
B..... 50 C.c.
C..... 40 minims
D..... 16 minims

Plates giving with ordinary developer hard and glassy negatives, give with this modification, very satisfactory results.

**47.**—Pyro Developer, with Ammonia.

A.—Bromide ammonium ..... ¼ ounce
Water..... 8 ounces
B.—Stronger ammonia (0.900)..... 1 ounce
Water..... 7 ounces
C.—Pyrogallol..... 1 drachm
Nitric acid..... 5 minims
Water..... 12 ounces

Take for correct exposure of A 40 minims, of B 20 minims, of C ½ ounce, and 2 ounces of water.

**48.**—Pyro Developer, with Carbonate of Sodium.

A.—Dissolve 2 ounces of granulated sulphite of sodium and ¼ ounce of meto-bisulphite of potassium in 32 ounces of distilled water, and add 1 ounce of pyrogallic acid.

Keep in well-stoppered bottles.

B.—Dissolve 8 ounces of granulated, or 16 ounces of crystallized, carbonate of sodium (common washing soda) in water enough to make a bulk of 32 ounces.

Mix 1 ounce of water with 1 drachm of A, add a few drops of B, and increase gradually till development proceeds regularly. If necessary, restrain with 10 per cent. solution of bromide of potassium.

**49.**—Pyro Developer, with Carbonate of Potassium.

A.—Pyro..... 1 ounce
Sulphite of sodium, granulated..... 2 ounces
Bromide of potassium..... 80 gr.
Citric acid ..... 60 gr.
Water..... 12 ounces
B.—Water..... 12 ounces
Sulphite of sodium, granulated..... 1 ounce
Carbonate of potash..... 3 ounces

1 drachm of each—A and B—to 1 ounce of water, make the developing solution.

**50.**—Hydrochinon Developer.

A.—Hydrochinon..... ¼ ounce
Sulphite of sodium, granulated..... 1 ounce
Meta-bisulphate of potassium..... 30 gr.
Water..... 16 ounces
B.—Carbonate of potassium..... 1½ ounces
Water..... 16 ounces

**51.**—Hydrochinon Developer in One Solution.

Hydrochinon..... ½ ounce
Sodium sulphite, granulated..... 2 ounces
Potassium carbonate..... 2 ounces
Water..... 32 ounces

For use, dilute 1 volume with 3 volumes of water.

**52.**—The Acid Fixing and Clearing Bath.

Add 2 ounces of S. P. C. Clarifier (acid bisulphite of sodium) solution to 1 quart of hypo solution 1 in 5.

**53.**—Combined Alum and Hypo Bath.

Add saturated solution of sulphite of sodium to saturated solution of alum till the white precipitate formed remains undissolved, and when the odor of sulphurous acid becomes perceptible.

Mix this solution with an equal bulk of freshly-prepared hypo solution 1 in 5, and filter.

This bath will remain clear.

**54.**—Clearing Solution (Edward's).

| | |
|---|---|
| Alum | 1 ounce |
| Citric acid | 1 ounce |
| Sulphate of iron, crystals | 3 ounces |
| Water | 20 ounces |

This should be freshly mixed.

**55.**—Clearing Solution.

| | |
|---|---|
| Saturated solution of alum | 20 ounces |
| Hydrochloric acid | 1 ounce |

Immerse negative after fixing and washing. Wash well after removal.

**56.**—Belitzki's Method for Removing the Last Traces of Hypo.

| | |
|---|---|
| Chloride of Lime | 20 Gm. |
| Water | 1 liter |

Add to the milky liquid

| | |
|---|---|
| Sulphate of zinc | 40 Gm. |

dissolved in from 80 to 100 C.c. of water; shake well and decant.

The clear, supernatant solution of hypochlorite of zinc is kept in well-closed bottles; 1 part of it mixed with 60 parts of water will remove the last traces of fixing soda.

The solution remains active as long as it smells of hypochlorous acid.

**57.**—To Remove Hypo from Films.

A solution of bromine in water, about 1 in 30, destroys the hypo in a gelatine film.

**58.**—Intensifier, with Mercury and Ammonia, for Gelatine Dry-Plates.

Pour over the well-washed negative a saturated solution of mercuric chloride (bichloride of mercury); do not keep it on too long, unless the negative is very thin. Wash well, and immerse in bath of

| | |
|---|---|
| Water | 10 ounces |
| Ammonia | 10 minims |

Leave the plate in this solution until the black color goes quite through the film. Wash well.

**59.**—Intensifier (Mercuric) with Sodium Sulphite, for Gelatine Dry-Plates.

Whiten the negative in the saturated solution of mercuric chloride, wash and blacken with a solution of sulphite of sodium 1 in 5. Wash well.

The reduction is perfect, with a positive black tone.

**60.**—Intensifier with Iodide of Mercury.

Dissolve 1 drachm of bichloride of mercury in 7 ounces of water and 3 drachms of iodide of potassium in 3 ounces of water, and pour the iodide solution into the mercury till the red precipitate formed is completely dissolved.

For use, dilute with water, flow over the negative till the proper density is reached, and wash, when the deposit will turn yellow. Remove the yellow color by flowing a 5 per cent. solution of hypo over the plate, and give it the final washing.

**61.**—Intensifier for Gelatine Dry-Plates with Mercuric Chloride and Hydrochinon (Dr. Mallman).

After whitening in the saturated solution of mercuric chloride, as usual, treat with an old hydrochinon developer; the result is a bluish-black intensification, which is applicable to positives as well as negatives.

**62.**—Reducer for Gelatine Dry-Plate Negatives (Farmer's).

| | |
|---|---|
| Sat. sol. of ferricyanide of potassium | 1 part |
| Hyposulphite of sodium solution, 1 in 10 | 10 parts |

**63.**—Reducer for Gelatine Dry-Plates.

| | |
|---|---|
| Perchloride of iron | 30 gr. |
| Citric acid | 60 gr. |
| Water | 1 pint |

**64.**—Belitski's Acid Ferric-Oxalate Reducer for Gelatine Plates.

| | |
|---|---|
| Water | 7 ounces |
| Potassium ferric oxalate | 2½ drachms |
| Crystallized neutral sulphite of sodium | 2 drachms |
| Powdered oxalic acid, from | 30 to 45 gr. |
| Hyposulphite of soda | 1½ ounces |

The solution must be made in this order, filtered, and be kept in tightly-closed bottles; and as under the influence of light the ferric salt is reduced to ferrous, the preparation must be kept in subdued light.

**65.**—To Reduce Intensity of Negatives.

Rub the parts to be reduced with a soft rag moistened with alcohol, till the density is softened down. For sharply defined outlines, use a pointed stick of soft wood dipped in alcohol.

The method may be well applied for the brightening up of flare spots and halation marks.

## ORTHOCHROMATIC METHODS BY BATHING.

**66.**—Orthochromatic Dry-Plates—F. Ives' Chlorophyll and Eosine Process.

Use any good bromide collodion emulsion that contains no free nitrate of silver. Flow plate as usual, and as soon as the emulsion film sets, flow several times with strong alcoholic solution of chlorophyll from blue myrtle, or plantain leaves; then immerse in water strongly tinted with blue shade eosine, and keep in motion until smooth.

Sensitizes for all colors, including deep ruby red; a very light-yellow screen is sufficient to secure correct rendering of color-tone.

**67.**—Orthochromatic Dry-Plates—V. Schumann's Cyanine Bath.

Soak the plate in 200 C.c. of water and 2 to 4 C.c. of stronger ammonia for two or three minutes, then immerse in

| | |
|---|---|
| Distilled water | 200 C.c. |
| Alcohol | 10 C.c. |
| Stronger ammonia (0.900) | 4 C.c. |
| Alcoholic solution of cyanine, 1 in 500 | 10 C.c. |

**68.**—Orthochromatic Dry-Plates—Erythrosine Bath (Mallmann and Scolik).

*Preliminary Bath.*

| | |
|---|---|
| A.—Water | 200 C.c. |
| Stronger ammonia | 2 C.c. |

Soak the plate for two minutes.

*Color Bath.*

| | |
|---|---|
| Erythrosine solution, 1 in 1000 | 25 C.c. |
| Stronger ammonia (0.900) | 4 C.c. |
| Water | 175 C.c. |

The plate should not remain longer in this bath than one and a quarter minutes.

**69.**—Obernetter's Method with Nitrate of Silver.

| | | | |
|---|---|---|---|
| Distilled water | 480 | C.c. = 16 | fluid ounces |
| Nitrate of silver | 1.25 | Gr. = 20 | gr. |
| Ammonium carbonate | 5 | Gr. = 75 | gr. |
| Erythrosine solution (1 in 500) | 35 | C.c. = 1⅛ | fluid ounces |
| Stronger ammonia (0.900) | 4 | C.c. = 1 | drachm |

Bathe the plate in the preliminary solution (see No. 68) for 150 seconds. Without washing flow the sensitizing solution over the plate twice, and dry in the dark closet.

**70.**—To Prepare Yellow Glass Screens.

Take of crushed (not powdered) curcuma root, 2 ounces, and macerate in 10 ounces of alcohol for three days. After filtering the tincture, mix with an equal bulk of ether, and add to each ounce of the mixture 6 grains of gun cotton.

With this collodion coat a plane parallel glass plate, which must be perfectly white, thin, and without any curvature.

## VARNISHES.

**71.**—Negative Varnishes.

| | |
|---|---|
| Sandarac | 4 ounces |
| Alcohol | 24 ounces |
| Oil of lavender | 3 ounces |
| Chloroform | 5 drachms |

**72.**—Negative Varnish.

| | |
|---|---|
| White hard varnish | 15 ounces |
| Alcohol | 25 ounces |

This will be found a good and cheap varnish if durability is not required, as it is easily rubbed up for retouching upon and easily cleaned off. Very suitable for enlarged negatives that are not to be retained.

**73.**—NEGATIVE VARNISH.

Tough, hard and durable.

| | |
|---|---|
| Shellac | 1¼ ounces |
| Mastic | ¼ ounce |
| Oil of turpentine | ¼ ounce |
| Sandarac | 2¼ ounces |
| Venice turpentine | ¼ ounce |
| Camphor | 20 gr. |
| Alcohol | 20 fluid ounces |

**74.**—NEGATIVE VARNISH.

| | |
|---|---|
| Sandarac | 90 ounces |
| Venice turpentine | 36 ounces |
| Oil of lavender | 10 ounces |
| Alcohol | 500 fluid ounces |

**75.**—STANDARD PHOTOGRAPHIC VARNISH.

| | |
|---|---|
| White shellac | 8 ounces |
| Orange shellac | 4 ounces |
| Sandarac | 1 ounce |
| Alcohol | 60 fluid ounces |

**76.**—RETOUCHING MEDIUM.

| | |
|---|---|
| Dammar | 70 gr. |
| Yellow resin | 6 drachms |
| Oil of turpentine | 4 ounces |

**77.**—NEGATIVE RETOUCHING VARNISH.

| | |
|---|---|
| Sandarac | 1 ounce |
| Castor oil | 80 gr. |
| Alcohol | 6 ounces |

First dissolve the sandarac in the alcohol, and then add the oil.

**78.**—GROUND-GLASS VARNISH.

| | |
|---|---|
| Sandarac | 90 gr. |
| Mastic | 20 gr. |
| Ether | 2 fluid ounces |
| Benzol | ½ to 1½ fluid ounces |

The proportion of the benzole added determines the nature of the mat obtained.

**79.**—ENCAUSTIC PASTE.

| | |
|---|---|
| Pure white wax | 500 parts |
| Elemi | 10 parts |
| Benzol | 200 parts |
| Oil of lavender | 300 parts |
| Oil of spike | 15 parts |

## PRINTING AND TONING ON ALBUMENIZED, PLAIN AND OTHER PAPERS.

**80.**—THE SILVER PRINTING BATH.

| | |
|---|---|
| Silver nitrate | 50 gr. |
| Water | 1 ounce |

Neutralize with carbonate of silver.

**81.**—MODIFIED SILVER BATH.

| | |
|---|---|
| Silver nitrate | 50 gr. |
| Ammonium nitrate or magnesium nitrate | 50 gr. |

To secure a neutral state of the bath, a little carbonate of silver should be kept at the bottom of the stock bottle.



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"LOVE'S MESSENGER."

By E. DONALD ROBERTS, Jr.

**82.**—The Price Toning Formula.

Into 7½ ounces of water dissolve 15 grains chloride of gold and sodinm, then add to it 300 grains of acetate of soda and 7 drops of a saturated solution of chloride of lime.

This stock solution should be prepared at least twenty-four hours before being used. Take ½ ounce of it and mix with 5 ounces of water.

**83.**—The Photographic Times Toning Bath.

Into 7½ ounces of water put 7½ grains chloride of gold and sodium. Label the bottle containing the mixture: *Chloride of gold solution*. Combine 6 ounces of water with 1 ounce *of French azotate*, to which add 1½ ounces of the chloride of gold solution.

**84.**—Borax Toning Bath.

| | |
|---|---|
| Chloride of gold solution, 1:50 | 3 C.c. |
| Borax solution, 1 to 10 | 100 C.c. |
| Water | 100 C.c. |

Can be used immediately.

**85.**—Charles W. Hearn's Toning Baths.

*With Sal Soda.*

| | |
|---|---|
| Distilled water | 64 ounces |
| Acid sol. of chloride of gold (4 grains to 1 ounce) | 1 ounce |
| Saturated solution of carbonate of sodium cryst.. | ½ ounce |

Should be prepared half an hour before use.

*With Chloride of Lime.*

| | |
|---|---|
| Water | 40 ounces |
| Chloride of lime | 5 gr. |
| Chloride of gold | 4 gr. |

**86.**—Abney and Robinson's Toning Baths.

| | |
|---|---|
| Chloride of gold | 1 gr. |
| Sodium carbonate | 10 gr. |
| Water | 10 ounces |

Should be used immediately after mixing. This bath gives purple and black tones.

**87.**—With Chalk and Chloride of Lime.

| | |
|---|---|
| Chloride of gold | 2 gr. |
| Saturated sol. of chloride of lime | 2 drops |
| Chalk | 1 pinch |
| Water | 16 ounces |

The bath should be prepared with hot water, and be kept for one day before using it.

**88.**—Dr. Liesegang's Toning Bath.

*With Tungstate of Sodium.*

| | |
|---|---|
| Tungstate of sodium | 20 Gm. |
| Boiling water | 1 liter |
| Chloride of gold | 1 Gm. |

**89.**—Dr. Liesegang's Toning Bath.

*With Phosphate of Sodium.*

| | |
|---|---|
| Phosphate of sodium | 15 Gm. |
| Chloride of gold | 1 Gm. |
| Water | 1 liter |

**90.**—Dr. Liesegang's Toning Bath.

*With Carbonate of Lime (Chalk).*

| | |
|---|---|
| Chloride of gold | 1 Gm. |
| Carbonate of sodium | 15 Gm. |
| Chalk | 5 Gm. |
| Water | 1 liter |

After twelve hours the bath is perfectly clear and colorless, when it is ready for use. It is very durable, and gives fine tones.

**91.**—Toning Bath for Ready Sensitized Paper.

| | |
|---|---|
| A.—Chloride of gold | 1 Gm. |
| Water | 1 liter |
| B.—Borax | 10 Gm. |
| Tungstate of sodium | 40 Gm. |
| Water | 1 liter |

**92.**—Printing on Plain Paper.

Prepare the plain paper with

| | |
|---|---|
| Ammonium chloride | 60 to 80 gr. |
| Sodium citrate | 100 gr. |
| Sodium chloride | 20 to 30 gr. |
| Gelatine | 10 gr. |
| Distilled water | 10 ounces |

or,

| | |
|---|---|
| Ammonium chloride | 100 gr. |
| Gelatine | 10 gr. |
| Water | 10 ounces |

The gelatine is first swelled in cold water and then dissolved in hot water, and the remaining components of the formula are added. The solution is filtered, and when still warm the paper floated upon it for three minutes.

The salted paper is sensitized upon a neutral 45-grain silver bath.

**93.**—Red Prints for Photo-Engravers.

| | |
|---|---|
| Citric acid | 100 gr. |
| Ammonium chloride | 100 gr. |
| Gelatine | 10 gr. |
| Water | 10 ounces |

Dissolve the citric acid in a small portion of water, and exactly neutralize with carbonate of soda (228 grains of common washing soda are required).

Float the paper on this bath for one to two minutes, and sensitize upon a 50-grain nitrate of silver solution. Fix in fresh hypo, without toning.

**94.**—Platinum Toning Bath, for Plain Silver Prints.

| | |
|---|---|
| Chloroplatinite of potassium | 1 Gm. |
| Water | 1 liter |
| Nitric acid | 5 to 10 drops |

**95.**—Toning Silver Prints After Fixing (Pizzighelli).

| | |
|---|---|
| Ammonium sulphocyanate | 300 Gm. |
| Gold chloride | 3 Gm. |
| Potassium hydrate | 3 Gm. |
| Water | 1000 Gm. |

**96.**—How to Print on Whatman's Drawing Paper.

Salt the paper in

| | |
|---|---|
| Water | 560 Gm. |
| Arrowroot (boiled) | 18 Gm. |
| Ammonium chloride | 16 Gm. |

by floating. Dry in horizontal position, and sensitize with a

Silver nitrate solution.....60 Gm. to 240 Gm. of water

to which

Citric acid.....25 Gm. in 240 Gm. of water

is added.

Print till a metallic lustre appears in the deeper shadows.

Tone with

| | |
|---|---|
| Chloroplatinite of potassium | 4 Gm. |
| Water | 560 Gm. |
| Nitric acid | 1 to 2 Gm. |

Fix in the ordinary hypo bath made alkaline with a few drops of ammonia.

The resulting tones are of a warm brown, when, adding sodium bisulphite to the hypo, the color will turn to a positive black.

**97.**—Pizzighelli's Platinum Paper.

| | |
|---|---|
| 1.—Chloroplatinite of potassium | 10 Gm. |
| Distilled water | 60 Gm. |
| 2.—Ferric oxalate | 20 Gm. |
| Oxalic acid | 1.5 Gm. |
| Water | 100 Gm. |
| 3.—2 per cent. solution of chlorate potassium | 0.4 Gm. |

For use, mix of

| | |
|---|---|
| 1 | 48 Gm. |
| 2 | 30 Gm. |
| 3 | 8 Gm. |
| Water | 8 Gm. |

The paper is coated with this solution by means of brush, sponge or cotton tuft.

Dry quickly without the application of heat, and keep the sensitive paper in a box and free from moisture.

When sufficiently exposed, develop with

| | |
|---|---|
| Oxalate potassium | 140 Gm. |
| Water | 500 Gm. |

acidified slightly with oxalic acid.

Fix in 1 part of hydrochloric acid and from 60 to 80 of water; finally wash.

The acid fixing bath should be applied three or four times successively.

When adding to the above developer from 1 to 2 Gm. of mercuric chloride, the otherwise black tone will change to an agreeable brown.

## ARISTOTYPE OR CHLORIDE OF SILVER COLLODION AND CHLORIDE OF SILVER GELATINE PRINTING

**98.**—Aristotype, or Chloride of Silver Collodion.

| | |
|---|---|
| A.—Nitrate of silver | 8 Gm. |
| Alcohol | 100 C.c. |
| B.—Chloride of strontium | 2 Gm. |
| Alcohol | 100 C.c. |

C.—Citric acid ..... 5 Gm.
Water ..... 100 C.c.

D.—Ether ..... 100 C.c.
Gun cotton ..... 4 Gm.
Alcohol ..... 100 C.c.

To 100 C.c. collodion (D) add first, by constant agitation, 10 C.c. of B and 10 C.c. of C; finally add 5 C.c. of A by vigorously shaking the mixture. The resulting emulsion is allowed to settle for twenty-four hours, and is then used for coating paper.

**99.**—Chloride of Silver Collodion (Geldmacher's).

*Solution* 1.

Gun cotton ..... 6½ fluid drachms
Ether ..... 15 fluid ounces
Alcohol ..... 15 fluid ounces
Castor oil ..... 1 drachm

*Solution* 2.

Nitrate of silver ..... 5 drachms 8 gr.
Water ..... 6 drachms
Alcohol ..... 1½ ounces

Dissolve in a warm water bath.

*Solution* 3.

Citric acid ..... 1 drachm 15 gr.

dissolved in

Alcohol ..... 2½ ounces

and

Chloride of strontium ..... 1 drachm 15 gr.

dissolved in

Alcohol ..... 2½ ounces

Make the two solutions separately and mix.

After all the solutions have been made, add No. 3 to No. 1, shake vigorously, and by subdued light add gradually, and in small portions at a time, the No. 2 solution by constant agitating.

After an hour's ripening, the collodion emulsion is ready for use.

The paper to be coated must be furnished with a substratum of sulphate of barium and gelatine.

**100.**—Woodbury's Formula for Gelatine Aristotypes.

Water ..... 8 ounces
Silver nitrate ..... ¼ ounce
Rochelle salts ..... 20 gr.
Ammonium chloride ..... 10 gr.
Alum ..... 50 gr.
Citric acid ..... 1 drachm
Gelatine ..... 1 ounce

Dissolve the gelatine in 6 ounces of water, the silver nitrate and the citric acid in 1 ounce of water, and the salts and alum in another ounce of water; add latter solution to gelatine, and stir well and pour in the silver solution gradually.

**101.**—Liesegang's Toning Bath for Aristotypes.

A.—Water ..... 20 ounces
Sulphocyanate of ammonium ..... 1 ounce
Alum ..... 1 ounce
Saturated solution of carbonate of ammonium ... 20 drops

B.—Water ..... 50 ounces
Chloride of gold ..... 15 gr.

**102.**—A. Stieglitz's Toning Bath for Aristotypes.

| | |
|---|---|
| 1.—Phosphate of sodium | 3 drachms |
| Water | 32 ounces |
| 2.—Chloride of gold | 15 gr. |
| Water | 16 ounces |

Mix. Allow to stand for twenty-four hours.

**103.**—Liesegang's Combined Toning Bath.

| | |
|---|---|
| Water | 32 ounces |
| Hyposulphite of sodium | 8 ounces |
| Sulphocyanate of ammonium | 1 ounce |
| Acetate of sodium | ½ ounce |
| Saturated solution of alum | 2 ounces |

and

| | |
|---|---|
| Water | 8 ounces |
| Chloride of gold | 15 gr. |
| Chloride of ammonium | 30 gr. |

Pour the gold solution into the hypo solution, then add 30 grains of freshly prepared chloride of silver.

**104.**—Combined Fixing and Toning Bath for Chloride of Silver Gelatine Paper.—Dr. F. Stolze's.

| | |
|---|---|
| Hyposulphite of sodium | 35 Gm. |
| Common salt | 9 Gm. |
| Alum | 4 Gm. |
| Sulphocyanate of ammonium | 2 Gm. |
| Water | 150 to 200 C.c. |

The compound will have matured for use in four to eight days.

Decant the clear solution from the deposit formed and filter. Immediately before use, add to above quantity, 2 C.c. chloride of gold solution 1 in 100. If the solution does not act with sufficient energy, a few C.c. of saturated alum solution may be added.

**105.**—Ilo Collodion Paper—Separate Toning Bath.

| Metric weight. | Apothecaries' weight. |
|---|---|
| *Stock Solution No. 1.* | |
| 2000 grammes water.<br>90 grammes acetate soda fused. | ½ gallon water.<br>3 ozs. acetate soda fused. |
| *Stock Solution No. 2.* | |
| 2000 grammes water.<br>30 grammes sulpho cyanide ammonia. | ½ gallon water.<br>1 oz. sulpho cyanide ammonia. |
| *Stock Solution No. 3.* | |
| 1 gramme chloride gold.<br>250 grammes water. | 15 grains chloride of gold.<br>8 ozs. water. |

Mix bath two hours before using, in the following proportions: No. 1, four parts; No. 2, one part, and No. 3, two parts.

Fix in a solution one part hypo to ten parts water.

If the tone is not what you wish, then place the toned and fixed print in an old combined bath, and you can obtain any desired effect.

Another Good Separate Toning Bath.

| Metric weight. | | Apothecaries' weight. | |
|---|---|---|---|
| Boiling water | 2000 grammes | Boiling water | ½ gallon |
| Sulpho cyanide ammonia | 75 grammes | Sulpho cyanide ammonia | 2½ ounces |
| Citric acid | 15 grammes | Citric acid | ½ ounce |
| Alum, powdered | 10 grammes | Alum, powdered | ⅓ ounce |
| Phosphate sodium | 30 grammes | Phosphate sodium | 1 ounce |
| Chloride of gold | 1 gramme | Chloride of gold | 15 grains |

Add two parts water to one part of this solution; it may be used one hour after mixing, when it has become cold.

Each of these Separate Baths possess good keeping qualities, and may be strengthened each time you use them by adding fresh solution.

### The Ilo Combined Bath.

We recommend to those who prepare their own bath, to mix in a six or seven gallon stone jar (with hole near bottom to insert wooden faucet), in order following:

| METRIC WEIGHT. | | APOTHECARIES' WEIGHT. | |
|---|---|---|---|
| Water | 16 liters | Water | 4⅜ gallons |
| Acetate of lead, C. P | 100 grammes | Acetate of lead, C. P. | 5⅛ ounces |
| Nitrate of lead, C. P. | 160 grammes | Nitrate of lead, C. P. | 5⅛ ounces |
| Alum, powdered | 120 grammes | Alum, powdered | 3⅞ ounces |
| Sulpho cyanide ammo., C.P. | 440 grammes | Sulpho cyanide ammo., C. P. | 14⅛ ounces |
| Citric acid | 120 grammes | Citric acid | 3⅞ ounces |
| Hypo | 4000 grammes | Hypo | 140 ounces |
| Chloride of gold | 6 grammes | Chloride of gold | 92 grains |

Dissolve thoroughly, let stand to settle and use the clear portion only.

This bath will keep any length of time, but if kept open to the air will evaporate and get stronger; it ought to be prepared in a large jar and then drawn off into bottles.

☞ The Combined Bath must *always* have a great *excess of hypo*. The hypo is constantly decomposed by the chemicals in the *paper* and in the *bath*, and this diminishes the fixing power. An exhausted bath *tones* very quickly, but fixes insufficiently, and yellow stains and green borders around vignettes are the results. Therefore, after every twenty-five cabinets toned, one-half ounce of a saturated solution of hypo must be added to the bath you are *using*.

A quart of this solution will tone 150 cabinet photos with perfect safety, and *when prints are washed previously*, 300 to 350.

It is best to use fresh bath every time, but when using old and new, always take three-quarters new, and *only one-quarter* old bath. Pour the used bath in a separate bottle.

### 106.—C. E. Hopkins's Omega Papers.

*Separate Toning and Fixing for Omega Paper.*—Print about the same as albumen paper. Wash through five or six changes of water, having the first two thoroughly alkali.

Have prepared the following solutions:

| | |
|---|---|
| Borax (saturated solution) | 1 to 12 ounces water |
| Acetate of soda (saturated solution) | 1 to 3 ounces water |
| Hypo soda (saturated solution | 1 to 1½ ounces water |
| Alum (saturated solution) | 1 to 10 ounces water |

For toning, use gold solution, 1 ounce; water 20 to 60 ounces; borax solution, to make nearly neutral; acetate of soda solution, 2 to 4 drachms.

Tone to nearly the desired tone, and place in plenty of water slightly acidified with acetic acid; rinse well, and fix from fifteen to thirty minutes in hypo solution, 9 to 12 ounces; borax solution, 3 to 6 ounces; liquid acid sulphite of soda, 1 drachm; alum solution, 10 to 20 ounces; water to make 1 gallon. The acid sulphite, added before the alum, prevents any precipitation. Time the fixing according to the depth of printing, tone, etc. If the high lights are clear and the print light enough, and the tone not too warm, take out in fifteen minutes; otherwise, leave in longer and strengthen the bath. The strength of the toning bath should be regulated to suit the strength of the paper, fresh paper toning much easier than old. Toning should occupy about ten minutes, and strength of bath regulated to that time.

Handle prints face down in all of the processes, and keep them moving; wash very thoroughly after fixing; mount, retouch and burnish in the ordinary way. For cleaning the surface of the prints after they are dry, use alcohol and a soft, clean cloth. In cool weather, and prints in ordinary condition, the smaller quantities indicated in the formula are sufficient; but more alum may be required in warm weather, in which case use more borax and hypo also. In case the high lights do not clear up in a reasonable time, the fixing bath should be strengthened.

*Combined Bath for Omega Paper.*

| | |
|---|---|
| Hot water | 1 gallon |
| Hypo soda | 12 ounces |
| Borax | 1 ounce |
| Alum | 4 ounces |

Dissolve thoroughly; place in evaporating dish; heat to near the boiling point (180 degs.); let cool, and filter. For use, to each 32 ounces add 1 drachm of an 8-grain solution acetate of lead, and 1 grain of gold. This ought to tone in about ten to fifteen minutes. If it should tone more rapidly than ten, add more of the stock solution; but if more slowly than fifteen, add a little more gold. Do not wash the prints previous to toning, but place them dry into the bath, one at a time, being careful to manipulate them briskly, and break all air bubbles. Do not place too many prints in the bath at once, and do not try to tone too many in a given quantity of solution. One quart of the bath will tone and fix from forty to fifty cabinets. Do not try more. Throw this away and use fresh. Should the film become soft, rinse through two or three changes of water, and soak them a few minutes in a plain bath of alum, about 4 ounces to the gallon. It is surprising what beautiful tones may be produced by this process—no indication of that "double tone" so common in combined baths. Stop the tone very nearly where you want it, as there is very little change in drying. If there is any inclination to stick to the rubbing-down paper, use a soft, wet sponge.

**107.**—Combined Toning and Fixing Bath (Ehrmann's).

| | |
|---|---|
| Dissolve | |
| Hyposulphite of soda | 16 ounces |
| in | |
| Water | 31 ounces |
| Also dissolve | |
| Alum | 3 ounces |
| in | |
| Water | 31 ounces |

Mix the two solutions and allow to stand for several days in an open jar or vessel till all sulphurous acid has evaporated. Then filter, and add 22 grains of nitrate of lead previously dissolved in water.

To 18 ounces of this solution add 5 grains of pure terchloride of gold dissolved in 2 ounces of water.

The gold solution should be added in small portions at a time, by constant stirring with a glass rod.

Twenty ounces of this bath will tone fifty 5 x 8s of any kind of aristo (chloride of silver emulsion) prints, but not more.

The best results were had upon Bradfisch Improved Aristo Paper.

## PRINTING ON SUBSTANCES OTHER THAN PAPER.

**108.**—Collodion for Porcelain Pictures.

*Fennemore's Method.*

| | |
|---|---|
| A.—Negative gun cotton | 60 gr. |
| Alcohol | 2 ounces |
| Ether | 3 ounces |

Dissolve 120 grains nitrate of silver in 3 ounces of hot alcohol, and add by constant stirring to the above collodion.

| | |
|---|---|
| B.—Chloride of strontium | 32 gr. |
| Citric acid | 24 gr. |

Reduce to a fine powder and dissolve in 4 ounces of alcohol, add

| | |
|---|---|
| Ether | 4 ounces |
| Gun cotton | 60 gr. |

The two collodions are to be mixed in equal proportions.

**109.** *Hern's Method.*

| | |
|---|---|
| A.—Alcohol | 7 ounces |
| Ether | 9 ounces |
| Gun cotton | 112 gr. |
| B.—Nitrate of silver | 486 gr. |
| Distilled water | 1 ounce |
| C.—Chloride of calcium | 128 gr. |
| Alcohol | 4 ounces |
| D.—Citric acid | 128 gr. |
| Alcohol | 4 ounces |

Decant 8 ounces of A, add 64 drops of B in small portions, stirring up well after every addition, and 4 drachms of C in the same way. Finally 4 drachms of D must be added in the same manner as the calcium solution.

**110.**—Printing on Silk.

| | |
|---|---|
| Boiling water | 80 ounces |
| Chloride of ammonium | 100 gr. |
| Iceland moss | 60 gr. |

When nearly cold, filter and immerse the silk for fifteen minutes. Sensitize for fifteen minutes in an acid 20-grain silver bath, and when dry stretch the fabric over cardboard. Print deeper than usual and tone in

| | |
|---|---|
| Water | 20 ounces |
| Acetate of sodium | 2 drachms |
| Chloride of gold | 3 gr. |
| Common whiting | a few gr. |

**111.**—Making Silver Prints on Wood.

| | |
|---|---|
| Gelatine | 45 gr. |
| White soap | 45 gr. |
| Water | 5¼ fluid ounces |

Soak the gelatine in water for five or six hours, then dissolve it with the aid of a water bath. Cut the soap into small pieces, and add to the gelatine solution, stirring the whole with a glass rod to insure a perfect mixture; then add powdered alum until the froth disappears, and strain through muslin. Cover the block with this mixture and a little zinc white, then wipe off so that a very thin film will be left, rubbing it gently, so that the film may be of as even a thickness as possible. After drying, apply with a badger's-hair brush a coating of the following composition:

| | |
|---|---|
| Albumen | 3¼ fluid ounces |
| Water | 2½ fluid ounces |
| Chloride of ammonium | 67½ gr. |
| Citric acid | 18¾ gr. |

Whip the albumen to a froth, and allow it to settle; to the limpid portion add the water, then the sal ammonia, and carefully stir with a glass rod. then add the citric acid. When the block is dry, sensitize with a solution of

| | |
|---|---|
| Nitrate of silver | 187½ gr. |
| Water | 3¼ fluid ounces |

Pour this upon the surface of the block, spread it evenly with a glass rod and pour off the excess. When the block is dry, expose it under a negative in the usual manner, until it is printed the exact shade desired. When printed, immerse the printed surface in a very strong solution of salt for about three minutes. Then wash it under a stream of water for a short time, and fix it by placing it face downward in a saturated solution of hyposulphite of soda. After fixing, wash under a stream of water for about ten minutes; when dry, it is finished, and ready for the engraver.

**112.**—To Transfer Photographs upon Wood for Engraving.

Float the reverse side of sensitized albumen paper for fifteen minutes upon a 4 per cent. solution of bichromate of potassium; dry well; expose to light till the picture is fairly visible; place the print upon a glass plate under water until the unacted on bichromate is dissolved out; after removal from the water, roll in with fatty ink.

When the picture is sufficiently blackened, and nearly dry, it can be transferred upon the engraver's block by rubbing it on carefully.

**113.**—Cyanotype, or Blue Printing Process.

| | |
|---|---|
| A.—Citrate of iron and ammonium | 1⅞ ounces |
| Water | 8 ounces |
| B.—Ferricyanide of potassium | 1¼ ounces |
| Water | 8 ounces |

Mix equal parts immediately before use and float the paper, Rives' plain, upon it for three minutes; hang up to dry.

*To Intensify Faint Blue Prints.*—Soak them for five minutes in a solution of 1 drachm of ferric chloride in 32 ounces of water, and wash again.

Cyanotype Process—Black Lines upon a White Ground.

| | |
|---|---|
| Water | 9 ounces |
| Gelatine | 3 drachms |
| Perchloride of iron solution (U. S. Ph.) | 6 drachms |
| Tartaric acid | 3 drachms |
| Ferric sulphate | 3 drachms |

Filter off any precipitate that may be found and coat any good, stout white paper with the full strength solution. Expose in sunlight till details or lines are visible, and develop with

| | |
|---|---|
| Gallic acid | 6 drachms |
| Alcohol | 6½ ounces |
| Water | 32 ounces |

Wash well in several changes of water.

**114.**—To Tone Bromide of Silver Prints and Diapositives to a Warm Color.

| | |
|---|---|
| A.—Uranium nitrate | 1 Gm. |
| Water | 100 Gm. |
| B.—Potassium ferricyanate | 2 Gm. |
| Glacial acetic acid | 8 Gm. |
| Water | 100 Gm. |

Mix immediately before use.

**115.**—Kallitype Printing (Formula No. 2).

Dissolve 15 Gm. of ferric oxalate in 500 C.c. of water, and 3 Gm. of silver nitrate in 500 C.c. of water. Mix the two solutions, and float the paper upon it for two minutes.

Print till the half shadows of the cliché are out, and develop in

| | |
|---|---|
| Water | 1000 Gm. |
| Rochelle salts | 10 Gm. |
| Borax | 7 Gm. |
| And of a saturated solution of potassium bichromate | from 2 to 4 drops |

The picture is thoroughly developed in fifteen minutes; afterward immerse it in diluted ammonia, 1:100; wash and dry.

Potassium bichromate acts here as a restrainer. Too much of it makes the print harsh and chalky, and a longer exposure is required to make a good print.

**116.**—The Kallitype (*The Photographic Times* Formula).

Coat stout but fine grained paper with a solution of

| | |
|---|---|
| Sodium ferric-oxalate | 6 drachms |
| Water | 2½ ounces |

Dry quickly without the application of heat, and print till the deeper shadow portions of the picture become visible. On removal of the print from the frame, immerse into a 1½ per cent. solution of nitrate of silver acidified slightly with citric acid, when the picture will develop brilliantly and with all detail.

Finally wash in pure water. A yellow tinge may be washed away with a 5 per cent. solution of oxalic acid.

**117.**—Formula for Vici (Kallitype) Paper, Hopkins's.

Use this paper when thoroughly dry. Do not print in rainy weather expecting superior results, nor after 4 P.M. expecting black tones. This paper prints but slightly; developing is done afterward.

Print in direct sunlight until deep shadows are well indicated.

Developing may be done in weak white light.

As with Omega paper, the prints when finished will be of a darker color than they appear in the developer. There is no chance in overdeveloping, care only being required in the printing. Do not expose prints in too strong white light until after having taken out of the fixing solution.

Immerse prints one at a time in either of the following solutions, breaking any air bubbles that may appear, until the yellow of the paper entirely disappears. This takes about five minutes.

Develop as soon as possible after removing from printing frame, as they continue to print after once exposed.

*Black Tones.*

| | |
|---|---|
| Water | 10 ounces |
| Rochelle salts | 1 ounce |
| Borax | ¾ ounce |

*Sepia Tones.*

| | |
|---|---|
| Water | 10 ounces |
| Rochelle salts | 1 ounce |
| Borax | 2 drachms |

Dissolve cold, shake well, leave any undissolved borax in bottle, and filter.

*Restraining Solution.*

| | |
|---|---|
| Bichromate of potash | 20 gr. |
| Water | 10 ounces |

15 to 20 minims must be added to 10 ounces of mixed developer.

Increasing the amount of this solution in the developer adds brilliancy to the prints, and prevents flatness. Increase it for feeble negatives, decrease it for intense; excess will totally destroy half tone. As prints are taken from the developing solution, place them in clear water. When prints are all developed, remove them from the water to the fixing bath, as follows:

| | |
|---|---|
| Water | 32 ounces |
| Ammonia | 2 drachms |

Leave the prints in this bath for ten minutes, or two baths for five minutes each for large quantities.

Wash for twenty minutes, mount and dry. Prints when finished may be toned with platinum in the following bath:

| | |
|---|---|
| Water | 20 ounces |
| Platinum potash chloride | 15 gr. |
| Citric acid | 5 gr. |

**118.**—Converting Blue Prints into Brown Prints.

Blue ferro-prussiate photographic prints may be converted into brown prints by the following process:

The positive blue print, thoroughly washed and dried, is plunged into a solution of ammonia, in which it is kept until it has nearly or entirely lost its color. (The operation lasts from two to four minutes.) The print is rinsed and plunged into a bath of tannic acid, the operation being stopped as soon as the desired sharpness and tone are obtained.

This last operation requires about ten minutes. If at the end of this time the color be not dark enough, it is intensified by adding to the bath a few drops of ammonia. After a lapse of one or two minutes, rinse in abundant water.

1. Solution for preparing the sensitized paper:

| | |
|---|---|
| Tartrate of iron and potassium | 15 Gm. |
| Red prussiate of potash | 12 Gm. |
| Rain water | 250 C.c. |

2. Solution to remove the color of the print:

| | |
|---|---|
| Stronger ammonia (0.900) | 100 C.c. |
| Rain water | 800 C.c. |

3. Solution to give the brown tone:

| | |
|---|---|
| Tannic acid | 10 Gm. |
| Rain water | 500 C.c. |

Dissolve and filter.

**119.**—Toning Blue Prints.

Blue prints may be given the black tone by plunging them into a solution of 4 parts of potash in 100 parts of water; then, when the blue color has entirely disappeared under the action of the potash, and a yellowish color has taken its place, they are immersed in a solution of 4 parts of tannin in 100 parts of water; then, washing them again, we obtain prints whose tone may be assimilated to that of pale writing ink.

**120.**—Pellett's Method for Making Blue Lines upon White Ground.

The formula is composed as follows:

| | |
|---|---|
| Gum arabic | 385 gr. |
| Sodium chloride | 46 gr. |
| Tartaric acid | 62 gr. |
| Perchloride of iron | 123 gr. |
| Water | 3½ ounces |

Highly sized and smooth paper is evenly coated with this mixture, dried in the dark, and exposed under a negative.

Develop with a saturated solution of ferrocyanide of potassium. Fix in a 1 to 20 solution of hydrochloric acid.

**121.**—Black Lines upon White Ground.

| | |
|---|---|
| Water | 9 ounces |
| Gelatine | 3 drachms |
| Solution of perchloride of iron (U. S. Ph.) | 6 drachms |
| Tartaric acid | 3 drachms |
| Ferric sulphate | 3 drachms |

Dissolve, filter and apply to the surface of stout paper (Steinbach medium roll).

After exposure to light, under a diapositive or drawing immerse the print in

| | |
|---|---|
| Gallic acid | 6 drachms |
| Alcohol | 6½ ounces |
| Water | 32 ounces |

when the greenish-yellow print will turn to inky black.

Finally wash in pure water.

## USEFUL RECEIPTS.

**122.**—To Find the Focal Length of a Lens—W. H. Sherman's Rule.

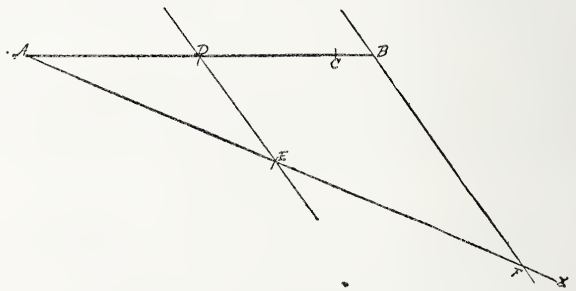
Make two images of any object of convenient length, so that the *difference* between the images will be equal to some part of the object, making the position of the ground-glass on the base of the camera where each image is in focus. The distance between the two positions of the ground-glass thus found will be the same part of the focal length that the difference of the two images is of the object.

Examples: With two images of a foot rule, let one image be 8 inches long and the other 4 inches. The difference being one-third the length of the object, the distance between the two positions of the ground-glass will be one-third of the focal length of the lens.

**123.**—To Calculate the Focal Fraction of Stops for Lenses.

Divide the focal length obtained by the above method expressed in inches and hundredths, by the diameter of stop opening expressed in hundredths of an inch.

**124.**—To Find Focal Length of a Lens (another Method, Sherman's).




Let the line AB represent the length of a given object; AC the length of its image on the ground glass, and CD the length of a smaller image; then AD will be the difference in length of the two images. Let the line AE represent the distance between the two positions of the ground glass when each image was in perfect focus on it. (AX is a line of indefinite length, making an acute angle with AB.) Draw the line DE, intersecting AB and AX; draw BF parallel to DE; AF will be the focal length.

**125.**—Labarraque's Solution.

| | |
|---|---|
| Chloride of lime | 2 ounces |
| Carbonate of sodium, cryst. | 4 ounces |
| Water | 40 ounces |

Mix the chloride of lime with 30 ounces of the water; and dissolve the carbonate of soda in the remainder. Mix, boil and filter.

**126.**—Eau de Javelle.

| | |
|---|---|
| Dry chloride of lime | 2 ounces |
| Carbonate of potash | 4 ounces |
| Water | 40 ounces |

Mix the chloride of lime with half of the water; dissolve the carbonate of potash in the remainder. Mix, boil and filter.

**127.**—A Few Remedies Against Blistering of Albumen Paper.

Do not dry the paper by excessive heat.
Avoid acidity in solutions.
Moisten the print before washing with a sponge saturated in alcohol.
Immerse the print before fixing in a weak alum.
Add a trace of aqua ammonia to the fixing bath.
Add one-tenth part of alcohol to the ordinary toning bath.

**128.**—Mat Black Varnish.

A tolerably strong solution of sandarac in alcohol, mixed with fine lampblack, dries without gloss, becomes hard without being brittle, and may be applied with a fine brush upon almost any substance.

**129.**—Invisible Ink.

| | |
|---|---|
| Chloride of cobalt | 50 gr. |
| Distilled water | 1 fluid ounce |
| Glycerine | 10 minims |

Dissolve the chloride of cobalt in the distilled water, and add the glycerine.

Writing executed with this ink is invisible on paper, but on warming the writing turns blue. On exposure to damp air it becomes invisible again.

**130.**—Solution for Making Paper Adhere to Metal.

| | |
|---|---|
| Tragacanth | 30 Gm. |
| Gum arabic | 120 Gm. |
| Water | 500 C.c. |

**131.**—To Precipitate Gold from Spent Sulphocyanate Toning Baths.

Add sulphuric acid and heat, when the gold will separate.

**132.**—To Keep Unmounted Albumen Prints Flat.

Soak them in equal parts of alcohol, glycerine and water; dry between blotting paper under slight pressure.

**133.**—Magic Photographs.

Fix an albumen print in perfectly fresh hypo solution and wash well, and soak it in a solution of 1 part bichloride of mercury, ¼ of a part of chloride of ammonium in 60 parts of water, till the photograph is bleached out.

The picture will appear again when brought into contact with hypo solution, or moistened blotting paper previously prepared with the fixing soda.

**134.**—Solution for Mounting Prints Without Their Cockling.

| | |
|---|---|
| Nelson's No. 1 photographic gelatine | 4 ounces |
| Water | 16 ounces |
| Glycerine | 1 ounce |
| Alcohol | 5 ounces |

Dissolve the gelatine in the water, then add the glycerine, and lastly the alcohol.

**135.**—Permanent Paste.

| | |
|---|---|
| Arrowroot | 10 Gm. |
| Water | 100 Gm. |

in which 1 gramme of gelatine has been soaked, and boil. After cooling add 10 grammes of alcohol and a few drops of carbolic acid.

**136.**—Leather Collodion.

| | |
|---|---|
| 2 p. c. collodion | 100 parts |
| Castor oil | 4 parts |

**137.**—Lubricator for Hot Burnishing.

| | |
|---|---|
| Spermaceti | 10 Gm. |
| Castile soap | 10 Gm. |
| Alcohol | 1 liter |

**138.**—To Remove Silver Stains from the Hands.

| | |
|---|---|
| Sulphate of sodium (Glauber's salt) | ½ ounce |
| Chloride of lime | ¼ ounce |
| Water | 1 ounce |

Mix thoroughly, and apply with an old toothbrush.

**139.**—To Frost a Skylight.

Very thin starch paste, to which unboiled starch has been added. Must be free from lumps, and be daubed on with a large bristle brush.

**140.**—To Remove Nitric Acid Stains from Hands or Garments.

Touch the stains with solution of permanganate of potassium; wash, rinse in dilute hydrochloric acid, and wash again.

**141.**—To Remove Yellow Stains from Bromide Prints.

Soak for one or two hours in

| | |
|---|---|
| Acetic acid | 2 ounces |
| Saturated oxalate of potassium solution | 4 ounces |

**142.**—To Remove Pyro Stains from Fingers.

Wash with à 10 per cent. solution of oxalic acid, or sulphuric acid, diluted with water, 1:20.

**143.**—To Remove Yellow Stains from Pyro Developed Negatives.

Bathe them in sulphorous acid water or in a 10 per cent. solution of sulphite of soda, to which a few drops of sulphuric acid has been added.

**144.**—To Remove the Odor of Hydrosulphate of Ammonium from the Dark-Room.

Sprinkle the floor with a solution of nitrate of lead.

**145.**—To Avoid Halation.

A quick drying coating, which is applied to the back of the plate, consists of collodion, with which any dark red or brown pigment is mixed. Spanish brown or rouge answers well.

**146.**—To Recover Silver Bromide from Waste Emulsion.

Let the emulsion be melted, and then add a small quantity of hydrochloric acid, following by boiling for two or three minutes. The silver bromide precipitates, and the destroyed gelatine is then poured off. The bromide is then placed among the other residues for reduction.

**147.**—Toning Bath for Gelatine Lantern Slides.

| | |
|---|---|
| Chloride of platinum | 1 gr. |
| Hydrochloric acid | 1 minim |
| Water | 32 ounces |

**148.**—Compound for Blocking Out Large Portions of a Negative.

Mix asphaltum varnish with fine lamp-black, and apply with a camel's-hair brush.

Should be kept in well-stoppered bottles.

**149.**—Flash-Light Powder for Orthochromatic Plates.

| | |
|---|---|
| Pure metallic magnesium powder | 10 gr |
| Nitrate of sodium (finely powdered) | from 50 to 70 gr. |

**150.**—Largest and Smallest Quantities of Chemicals Admitted to the Pyro Developer.

| | Largest. | Smallest. |
|---|---|---|
| Pyro, per ounce | 10 gr. | 1¼ gr. |
| Sulphite of sodium | 80 gr. | 5 gr. |
| Carb. of sodium | 40 gr. | 1 1-5 gr. |
| Carb. of potassium | 21 2-10 gr. | 5 gr. |

**151.**—Consumption of Chemicals in Silver Printing on Albumenized Paper.

Of 100 parts of silver used in the albumen printing process will be found

| | |
|---|---|
| In the finished print | 3 per cent |
| In filters, blottings and cuttings | 7 per cent |
| In the wash water before toning | 50 to 55 per cent |
| In the fixing bath | 30 to 35 per cent |
| In the wash water after fixing | 5 per cent |

90 per cent. of the silver used may be recovered.

One sheet of paper, 18 x 22, will take from the silver bath from 30 to 45 grains of nitrate of silver.

One sheet of paper, 18 x 22, requires to tone 1½ grains of gold (1 decigram).

About 80 to 90 grains of hyposulphite of sodium are necessary to fix one sheet of paper, 18 x 22.

# TABLE SHOWING COMPARATIVE VALUE OF ALKALINE CARBONATES IN DEVELOPERS. By O. G. Mason.

| Commercial Name. | Chemical Symbol. | Molecular Weight. | The Commercial Salt contains of the pure Salt about | 100 parts of 36 per cent Acetic Acid Require for Saturation. | Solubility in Water (approximate). |
|---|---|---|---|---|---|
| Soda, Caustic | NaHO | 40 | 80 to 92% | 26.66 p'rts of 90% Soda | 1 part in 2 |
| Sodium Carbonate, Carbonate of Soda, Sal Soda, Crystals, | $Na_2CO_3.10H_2O$ | 286 | 96 to 98% | 89.38 " 96% " | 1 " 2 |
| The same, anhydrous or in dry powder | $Na_2CO_3$ | 106 | About 98 to 99% | 89.38 of 98 to 99% dry Sal Soda. | 1 " 6 |
| Sodium Bicarbonate, Bicarbonate of Soda, "Sesqui-carbonate of Soda," | $NaHCO_3$ | 84 | 98 to 100% | 50.91 of 99% Bicarb. Soda. | 1 " 12 |

Equal work is done by 80 parts of Caustic Soda, 286 parts of Sal Soda (crystals), 106 parts of Sal Soda (dry), 168 parts of Bicarbonate of Soda. These quantities must be increased to make up for any impurity contained in the sample being used; for this purpose the usual percentage of impurity given in the above table may be assumed for all ordinary photographical uses.

| | | | | | |
|---|---|---|---|---|---|
| Potassa (Caustic Potash) | KHO | 56 | 80 to 95% | 37.33 parts of 90% Potassa. | 1 part in 1 |
| Potassium Carbonate, Carbonate of Potassa, Sal Tartar, Saleratus, | $K_2CO_3.1\frac{1}{2}H_2O$ | 165 | 76 to 96% Usually about 81% | 51.11 parts of 81% Carb. Potassa. | 1 " 1 |
| Potassium, Carbonate, dry | $K_2CO_3$ | 140 | About 95% | 122.74 parts of 95% Carb. Potassa. | 1 " 1 |
| Potassium Bicarbonate, Bicarbonate of Potassa, | $KHCO_3$ | 100 | 100% | 60 parts of 100% Bicarb. Potassa. | 1 " 4 |

Equal work is done by 112 parts Caustic Potassa, 165 parts (about) ordinary Carbonate Potassa, 200 parts of Bicarbonate Potassa. These quantities must be increased in proportion to impurities, as noted in case of Soda. These two alkalies are interchangeable for doing the same amount of work when *pure*, and when the one named in a given formula can not be obtained the table may assist in choosing a substitute of proper strength and solubility.

Dry or anhydrous Carbonate of Potassium is not usually found in the market.




The Electro-Light Engraving Co., N. Y.

"HIS LAST RESOURCE."
By ALEX. KEIGHLEY.

# TABLE OF STRENGTHS OF ALCOHOL.

Specific Gravities of Mixtures of Different Proportions of Alcohol (s. g. .7932) and Water, by Weight and by Volume, at 14° R. (63.5° F.) Meisner.

| Parts of | | Specific Gravity of Mixture by Weight. | Specific Gravity of Mixture by Volume. | Parts of | | Specific Gravity of Mixture by Weight. | Specific Gravity of Mixture by Volume. |
|---|---|---|---|---|---|---|---|
| Alcohol. | Water. | | | Alcohol. | Water. | | |
| 100 | 0 | 0.7932 | 0.7932 | 49 | 51 | 0.9196 | 0.9324 |
| 99 | 1 | 0.796 | 0.7969 | 48 | 52 | 0.9219 | 0.9344 |
| 98 | 2 | 0.7988 | 0.8006 | 47 | 53 | 0.9242 | 0.9364 |
| 97 | 3 | 0.8016 | 0.8042 | 46 | 54 | 0.9264 | 0.9384 |
| 96 | 4 | 0.8045 | 0.8078 | 45 | 55 | 0.928 | 0.9404 |
| 95 | 5 | 0.8074 | 0.8114 | 44 | 56 | 0.9308 | 0.9424 |
| 94 | 6 | 0.8104 | 0.815 | 43 | 57 | 0.9329 | 0.9443 |
| 93 | 7 | 0.8135 | 0.8185 | 42 | 58 | 0.9350 | 0.9461 |
| 92 | 8 | 0.8166 | 0.8219 | 41 | 59 | 0.9371 | 0.9478 |
| 91 | 9 | 0.8196 | 0.8253 | 40 | 60 | 0.9391 | 0.9495 |
| 90 | 10 | 0.8225 | 0.8286 | 39 | 61 | 0.9410 | 0.9512 |
| 89 | 11 | 0.8252 | 0.8317 | 38 | 62 | 0.9429 | 0.9529 |
| 88 | 12 | 0.8279 | 0.8346 | 37 | 63 | 0.9448 | 0.9547 |
| 87 | 13 | 0.8304 | 0.8373 | 36 | 64 | 0.9467 | 0.9564 |
| 86 | 14 | 0.8329 | 0.840 | 35 | 65 | 0.9486 | 0.958 |
| 85 | 15 | 0.8353 | 0.8427 | 34 | 66 | 0.9505 | 0.9695 |
| 84 | 16 | 0.8376 | 0.8454 | 33 | 67 | 0.9524 | 0.9609 |
| 83 | 17 | 0.8399 | 0.8581 | 32 | 68 | 0.9543 | 0.9621 |
| 82 | 18 | 0.8422 | 0.8508 | 31 | 69 | 0.9561 | 0.9632 |
| 81 | 19 | 0.8446 | 0.8534 | 30 | 70 | 0.9578 | 0.9643 |
| 80 | 20 | 0.847 | 0.8561 | 29 | 71 | 0.9594 | 0.9654 |
| 79 | 21 | 0.8494 | 0.8596 | 28 | 72 | 0.9608 | 0.9665 |
| 78 | 22 | 0.8519 | 0.8616 | 27 | 73 | 0.9621 | 0.9676 |
| 77 | 23 | 0.8543 | 0.8642 | 26 | 74 | 0.9634 | 0.9688 |
| 76 | 24 | 0.8567 | 0.8668 | 25 | 75 | 0.9647 | 0.970 |
| 75 | 25 | 0.859 | 0.8695 | 24 | 76 | 0.966 | 0.9712 |
| 74 | 26 | 0.8613 | 0.8723 | 23 | 77 | 0.9673 | 0.9723 |
| 73 | 27 | 0.8635 | 0.8751 | 22 | 78 | 0.9686 | 0.9734 |
| 72 | 28 | 0.8657 | 0.8779 | 21 | 79 | 0.9699 | 0.9745 |
| 71 | 29 | 0.868 | 0.8806 | 20 | 80 | 0.9712 | 0.9756 |
| 70 | 30 | 0.8704 | 0.8833 | 19 | 81 | 0.9725 | 0.9766 |
| 69 | 31 | 0.8729 | 0.886 | 18 | 82 | 0.9738 | 0.9775 |
| 68 | 32 | 0.8755 | 0.8885 | 17 | 83 | 0.9751 | 0.9784 |
| 67 | 33 | 0.8781 | 0.891 | 16 | 84 | 0.9763 | 0.9793 |
| 66 | 34 | 0.8806 | 0.8934 | 15 | 85 | 0.9795 | 0.9803 |
| 65 | 35 | 0.8831 | 0.8958 | 14 | 86 | 0.9786 | 0.9813 |
| 64 | 36 | 0.8855 | 0.8982 | 13 | 87 | 0.9796 | 0.9823 |
| 63 | 37 | 0.8879 | 0.9096 | 12 | 88 | 0.9806 | 0.9834 |
| 62 | 38 | 0.8902 | 0.9029 | 11 | 89 | 0.9817 | 0.9846 |
| 61 | 39 | 0.8925 | 0.9052 | 10 | 90 | 0.9830 | 0.9849 |
| 60 | 40 | 0.8948 | 0.9075 | 9 | 91 | 0.9844 | 0.9873 |
| 59 | 41 | 0.8971 | 0.9098 | 8 | 92 | 0.9860 | 0.9888 |
| 58 | 42 | 0.8994 | 0.9121 | 7 | 93 | 0.9878 | 0.9901 |
| 57 | 43 | 0.9016 | 0.9145 | 6 | 94 | 0.9897 | 0.9915 |
| 56 | 44 | 0.9038 | 0.9168 | 5 | 95 | 0.9914 | 0.9929 |
| 55 | 45 | 0.9060 | 0.9191 | 4 | 96 | 0.9931 | 0.9943 |
| 54 | 46 | 0.9082 | 0.9214 | 3 | 97 | 0.9948 | 0.9957 |
| 53 | 47 | 0.9104 | 0.9237 | 2 | 98 | 0.9965 | 0.9971 |
| 52 | 48 | 0.9127 | 0.9259 | 1 | 99 | 0.9982 | 0.9985 |
| 51 | 49 | 0.915 | 0.9281 | 0 | 100 | 1.0000 | 1.0000 |
| 50 | 50 | 0.9173 | 0.9303 | .. | .. | ..... | ..... |

# TABLE OF THE SYMBOLS, ATOMICITY, ATOMIC AND EQUIVALENT WEIGHTS OF THE ELEMENTS.

| Name. | Symbol. | Atomicity. | Atomic Weight. | Equivalent Weight. |
|---|---|---|---|---|
| Aluminum | Al | iii (iv) | 27.5 | 13.7 |
| Antimony (Stibium) | Sb | iii (v) | 122.0 | 122.0 |
| Arsen | As | iii (v) | 75.0 | 75.0 |
| Barium | Ba | ii | 137.0 | 68.5 |
| Beryllium (Glucinum) | Be | ii or iii | 9.4 | 4.7 |
| Bismuth | Bi | iii (v) | 208.0 | 208.0 |
| Boron | Bo | iii (v) | 11.0 | 11.0 |
| Bromine | Br | i (iii, v, vii) | 80.0 | 80.0 |
| Carbon | C | iv | 12.0 | 6.0 |
| Cadmium | Cd | ii | 112.0 | 56.0 |
| Caesium | Cs | i | 133.0 | 133.0 |
| Calcium | Ca | ii | 40.0 | 20.0 |
| Cerium | Ce | iii (iv) | 138.0 | 46.0 |
| Chlorine | Cl | i (iii, v, vii) | 35.5 | 35.5 |
| Chromium | Cr | iv (vi) | 52.2 | 26.1 |
| Cobalt | Co | ii (iv) | 58.8 | 29.4 |
| Copper | Cu | ii | 63.4 | 31.7 |
| Didymium | Di | iii | 145.0 | |
| Erbium | E | iii | 169.0 | |
| Fluorine | F | i | 19.0 | 19.0 |
| Gallium | Ga | iv | 68.0 | |
| Germanium | Ge | iv | 72.2 | |
| Glucinum | G | ii | 9.4 | 4.7 |
| Gold | Au | i (iii) | 196.0 | 196.0 |
| Hydrogen | H | i | 1.0 | 1.0 |
| Indium | In | iii (iv?) | 113.4 | 37.8 |
| Iodine | I | i, iii, v, vii | 127.0 | 127.0 |
| Iridium | Ir | ii (iv, vi) | 198.0 | 99.0 |
| Iron | Fe | ii (iv, vi) | 56.0 | 28.0 |
| Lanthanium | La | iii | 139.0 | 46.3 |
| Lead (Plumbum) | Pb | ii (iv) | 207.0 | 103.5 |
| Lithium | Li | i | 7.0 | 7.0 |
| Magnesium | Mg | ii | 24.0 | 12.0 |
| Manganese | Mn | ii (iv, vi, vii) | 55.0 | 27.5 |
| Mercury | Hg | ii | 200.0 | 100.0 |
| Molybdenum | Mo | vi | 96.0 | 46.0 |

## TABLE OF THE SYMBOLS, ETC.—(*Continued.*)

| Name. | Symbol. | Atomicity. | Atomic Weight. | Equivalent Weight. |
|---|---|---|---|---|
| Niobium (Columbium) | Nb | v | 94.0 | 18.8 |
| Nickel | Ni | ii (iv) | 58.8 | 29.4 |
| Nitrogen | N | iii (v) | 14.0 | 14.0 |
| Osmium | Os | ii (iv, vi, viii) | 199.0 | 99.5 |
| Oxygen | O | ii (iv?) | 16.0 | 8.0 |
| Palladium | Pd | (ii, iv, vi) | 106.6 | 53.25 |
| Phosphorus | P | iii (v) | 31.0 | 31.0 |
| Platinum | Pt | ii (iv, vi) | 197.4 | 98.7 |
| Potassium (Kalium) | K | i | 39.0 | 39.0 |
| Rhodium | Rh | ii (vi) | 104.4 | 52.2 |
| Rubidium | Rb | i (v) | 85.4 | 85.4 |
| Ruthenium | Ru | ii (iv, vi, viii) | 104.4 | 52.2 |
| Scandium | Sc | ii (iv, vi, viii) | 43.9 | 52.2 |
| Selenium | Se | ii (iv, vi) | 79.4 | 39.7 |
| Silicon (Silicium) | Si | iv | 28.0 | 14.0 |
| Silver (Argentum) | Ag | i | 108.0 | 108.0 |
| Sodium (Natrium) | Na | i | 23.0 | 23.0 |
| Strontium | Sr | ii | 87.5 | 43.7 |
| Sulphur | S | ii (iv, vi) | 32.0 | 16.0 |
| Tantalum | Ta | v | 182.0 | 36.4 |
| Tellurium | Te | ii (iv, vi) | 127.0 | 64.0 |
| Thallium | Tl | i (iii) | 204.0 | 204.0 |
| Thorium | Th | iv | 231.5 | 57.87 |
| Tin (Stannum) | Sn | ii, iv | 118.0 | 59.0 |
| Tungsten (Wolfram) | W | iv, vi | 184.0 | 92.0 |
| Uranium | U | vi (iv) | 240.0 | 60.0 |
| Vanadium | V | iii (v) | 51.2 | 51.2 |
| Ytterbium | Yt | iv | 172.6 | 17.1 |
| Yttrium | Y | ii | 61.7 | 30.85 |
| Zinc | Zn | ii | 65.0 | 32.5 |
| Zirconium | Zr | iv | 90.0 | 44.8 |

# TABLE OF SYMBOLS, ATOMIC WEIGHT AND SOLUBILITIES OF THE PRINCIPAL CHEMICALS USED IN PHOTOGRAPHY.

*Abbreviations.*—s., soluble; v. s., very soluble; sp. s., sparingly soluble; n. s., not soluble; dec., decomposed; del., deliquescent.

| Name. | Symbol. | Molecular Weight. | One Part is Soluble in Cold Water. | One Part is Soluble in Hot Water. | Alcohol. |
|---|---|---|---|---|---|
| Acid, Acetic | $C_2H_4O_2$ | 60 | in any proportion. | | |
| " Boric or Boracic | $H_3BO_3$ | 62 | 25 | 3 | 6 |
| " Carbolic (see Phenol) | $C_6H_6O$ | 94 | 16.6 | 3 | 6 |
| " Citric | $C_6H_8O_7+H_2O$ | 210 | 0.75 | 0.5 | s. |
| " Digallic (see Tannin) | $C_{27}H_{22}O_{17}$ | 618 | 0.8 | 0.5 | 0.8 |
| " Gallic | $C_7H_6O_5+H_2O$ | 188 | 100 | 3 | 8 |
| " Hydrobromic | HBr | 81 | s. | s. | s. |
| " Hydroiodic | HI | 128 | s. | s. | s. |
| " Hydrochloric | $HCl+7H_2O$ | 36.5 | s. | s. | s. |
| " Hydrofluoric | $HFl+3H_2O$ | 74 | s. | s. | s. |
| " Hydrocyanic | HCy | 27 | s. | s. | s. |
| " Hydrosulphuric | $H_2S$ | 34 | s. | s. | s. |
| " Muriatic (see Hydrochloric) | | | | | |
| " Nitric | $HNO_3$ | 63 | in all proportions. | | |
| " Nitrous | $HNO_2$ | 47 | absorbed. | | |
| " Oxalic | $C_2H_2O_4+2H_2O$ | 126 | 8 | 0.2 | s. also in ether |
| " Pyrogallic (see Pyrogallol) | $C_6H_6O_3$ | 126 | 2 | v. s. | also v. s. in ether. |
| " Salicylic | $C_7H_6O_3$ | 138 | 7.6 | 9 | also v. s. in ether. |
| " Sulphuric | $H_2SO_4$ | 98 | in all proportions. | | |
| " Sulphurous | $H_2SO_3$ | 82 | absorbed. | | |
| " Tannic (see Digallic) | | | | | |
| " Tartaric | $C_4H_6O_4$ | 150 | 0.8 | 0.5 | 5 |
| Alcohol, Ethyl | $C_2H_6O$ | 46 | in all proportions. | | |

| | | | | | |
|---|---|---|---|---|---|
| Alcohol, Methyl (see Wood Alcohol) | $CH_4O$ | 32 | in all proportions. | | |
| Alum (see Potassium Aluminium Sulphate) | $Al_2(SO_4)_3K_2SO_424H_2O$ | 948 | 10 | 8 | n. s. |
| Alum Chrome (see Potassium Chromic Sulph.) | $Cr_2(SO_4)_3K_2SO_424H_2O$ | 999 | 10 | dec. | n. s. |
| Amidol (Diamido Phenol) | $C_6H_8N_2O$ | 124 | very soluble. | | |
| Ammonia, Gaseous | $NH_3$ | 17 | very soluble. | | |
| Ammonium Bichromate | $(NH_4)_2Cr_2O_7$ | 252 | v. s. | v. s. | |
| " Bromide | $NH_4Br$ | 98 | 1.29 | 0.7 | 31.5 |
| " Cadmium Bromide | $2NH_4Br2CdBr_2+H_2O$ | 584 | 0.73 | | 5.3 |
| " " Iodide | $2NH_4ICdI_2+2H_2O$ | 692 | 0.58 | | 0.70 |
| " Chloride | $NH_4Cl$ | 53.5 | 3 | 1 | sp. s. |
| " Ferric Oxalate | $Fe_2(C_2O_4)_6(NH_4)_6+8H_2O$ | 892 | 2.10 | 0.29 | sp. s. |
| " Fluoride | $NH_4Fl$ | 37 | v. s. | v. s. | sp. s. |
| " Iodide | $NH_4I$ | 145 | 1 | 0.5 | s. |
| " Nitrate | $NH_4NO_3$ | 80 | 2 | 1 | s. |
| " Oxalate | $(NH_4)_2C_2O_4$ | 124 | 4 | 2 | s. |
| " Sulphide | $NH_4HS$ | 51 | v. s. | v. s. | o. s. |
| " Sulpho-Cyanate | $NH_4CNS$ | 76 | s. | s. | s. |
| Aurantia (Hexanitro-diphenylamin Ammonia) | $C_{12}H_1(NO_2)_6N,NH_4$ | 456 | | | |
| Aurin (Trioxy-triphenyl-Carbinol) | $C_{19}H_{14}O_3$ | 290 | | | |
| Barium Chloride | $BaCl_2+2H_2O$ | 345 | 2.18 | 1.5 | sp. s. |
| " Nitrate | $Ba(NO_3)$ | 261 | 12.2 | 2.84 | n. s. |
| " Per-oxide | $BaO_2$ | 169 | v. s. | n. s. | n. s. |
| Benzole or Benzine (Trioxy-triphenyl-Carbinol) | $C_6H_6$ | 78 | n. s. | n. s. | s. |
| Borax (see Sodium Biborate) | | | | | |
| Cadmium Bromide | $CdBr_2+4H_2O$ | 344 | 1.5 | 1 | sp. s. |
| " Iodide | $CdI_2$ | 366 | 1 5 | 1 | s. |
| Calcium Bromide | $CaBr_2+4H_2O$ | 272 | 1 | .75 | s. |
| " Carbonate (see Chalk) | $CaCO_3$ | 100 | n. s. | n. s. | n. s. |
| " Chloride | $CaCl_2$ | 111 | .75 | .5 | 10. |
| " Hypochlorite (see Chloride of Lime) | $CaCl_2O_2CaCl_2(?)$ | 254 | sp. s. | sp. s. | dec. |
| Calomel (see Mercurous Chloride) | | | | | |
| Camphor | $C_{10}H_{16}O$ | 152 | 1000 | | v. s. |
| Caustic Potash (see Potassium Hydrate) | | | | | |
| " Soda (see Sodium Hydrate) | | | | | |
| Chalk (see Calcium Carbonate) | | | | | |

# TABLE OF SYMBOLS, ATOMIC WEIGHT AND SOLUBILITIES OF THE PRINCIPAL CHEMICALS USED IN PHOTOGRAPHY.

*Abbreviations.*—s., soluble; v. s., very soluble; sp. s., sparingly soluble; n. s., not soluble; dec., decomposed; del., deliquescent.

| NAME. | SYMBOL. | MOLECULAR WEIGHT. | ONE PART IS SOLUBLE IN COLD WATER. | ONE PART IS SOLUBLE IN HOT WATER. | ALCOHOL. |
|---|---|---|---|---|---|
| Chinoline Blue or Cyanine | $C_{29}H_{35}NaI$ | 538 | sp. s. | sp. s. | s. |
| " Red | $C_{26}H_{19}NaCl$ | 394.5 | | | |
| Chloride of Lime (see Calcium Hypochlorite) | | | | | |
| Chlorine | Cl | 35.5 | absorbed by 1 to 2.5 vols. | | |
| Chloroform | $CHCl_3$ | 119.5 | sp. s. | sp. s. | v. s. |
| Chrome Alum (see Alum Chrome) | | | | | |
| Copper Acetate (see Verdigris) | $Cu(C_3H_3O_2)_2,H_2O$ | 199 | 14 | 5 | 1 in 14 |
| " Bromide | $CuBr_2$ | 223.4 | 1 | .75 | s. |
| " Chloride | $CuCl_2,H_2O$ | 170.5 | 1 | .75 | v. s. |
| " Sulphate (see Blue Vitriol) | $CuSO_4,5H_2O$ | 249.2 | 3 | 1 | n. s. |
| " " and Ammonia | $CuSO_4,4NH_3+H_2O$ | 245.5 | s. | v. s. | n. s. |
| Corrosive Sublimate (see Mercuric Chloride) | | | | | |
| Dextrine | $C_6H_{10}O_5$ | 162 | easily s. | | n. s. |
| Eikonogen (Amido-$\beta$-Naphthol-$\beta$-Monosulphonate of Sodium) | $C_{16}H_3SO_2NaN$ | 261 | 40 | e. s. | s. |
| Eosine, Yellow Shade (Tetra Bromo-fluoresceine Potassium) | $C_{20}H_6Br_4O_5K_2$ | 724 | s. | s. | s. |
| Eosine, Red Shade (Tetra Brom.-fluores. Sod.) | $C_{20}H_6Br_4O_5Na_2$ | 692 | s. | s. | s. |
| Epsom Salt (see Magnesium Sulphate) | | | | | |
| Erythrosine M. (Tetra Iodo-fluoresceine Potassium or Sodium) | $C_{20}H_6I_4O_5K_2$ or $Na_2$ | 912 or 880 | s. | s. | s. |
| Erythrosine G. (Di-iodo-fluoresceine Potassium or Sodium) | $C_{20}H_6I_2O_5K_2$ or $Na_2$ | 660 or 628 | s. | s. | s. |

| | | | | | |
|---|---|---|---|---|---|
| Gelatine, Glutine | 49,3C,6,6H18,3N25,8O | 1267.2 | sp. s. | e. s. | n. s. |
| Glycerine | $C_3H_8O_3$ | 92 | in all proportions. | | |
| Glycine (Oxy-phenylglycine) | $C_8H_9O_3N$ | 167 | ..... | ..... | ..... |
| Gold, Neutral Chloride | $AuCl_3$ | 303.5 | 1 | 5 | also in ether. |
| " and Cadmium Chloride | $CaAuCl_5$ | 414.5 | s. | s. | s. |
| " and Potassium Chloride | $KAuCl_4+5H_2O$ | 468 | s. | s. | s. |
| " and Sodium Chloride | $NaAuCl_4+8NaCl+2H_2O$ | 892 | s. | s. | s. |
| " Sodium Hyposulphite | $AuNa_3S_4+2H_2O$ | 525 | s. | s. | s. |
| Gun Cotton (Tetra-nitrate Cellulose) | $C_{12}H_{16}O_6(NO_3)_4$ | 564 | n. s. | n. s. | { in ether |
| " " (Tri-nitrate Cellulose) | $C_{10}H_{17}O_7(NO_6)_3$ | 459 | n. s. | n. s. | { alcohol |
| Hydrochinone | $C_6H_6O_2$ | 110 | s. | s. | also in ether. |
| Hydroxylamine Hydrochlorate | $NH_3OHCl$ | 69.5 | 0.6 | e. s. | 4 |
| Iodine | I | 127 | sp. s. | sp. s. | e. s. |
| Iridium Tetra-chloride | $IrCl_4$ | 335 | ..... | ..... | ..... |
| Iron, Ammonium Sulphate | $FeSO_4(NH_4)_2SO_4+6H_2O$ | 392 | v. s. | dec. | n. s. |
| " Chloride (Ferric) | $Fe_2Cl_6$ | 325 | .75 | .5 | 1 in 1 |
| " Chloride (Ferrous) | $FeCl_2$ | 127 | 2 | 1 | 1 in 1 |
| " Citrate | $Fe_2(C_6H_5O_7)_2$ | 598 | s. | s. | n. s. |
| " Citrate and Ammonia | $(C_6H_5O_7)_2Fe_2(NH_4)_3$ | 355 | s. | s. | sp. s. |
| " Iodide | $FeI_2$ | 310 | v. s. | v. s. | v. s. |
| " Nitrate | $Fe(NO_3)_2,6H_2O$ | 288 | v. s. | dec. | dec. |
| " Oxalate (Ferric) | $Fe_2(C_2O_4)_3$ | 376 | s. | s. | n. s. |
| " " (Ferrous) | $FeC_2O_4$ | 144 | in potas sium oxal. | | n. s. |
| " Sulphate (Ferric) | $Fe_2(SO_4)_3$ | 400 | s. | dec. | s. |
| " " (Ferrous) | $FeSO_4,7H_2O$ | 278 | 1.5 | 1 | n. s. |
| Kaoline | $H_2Al_2Si_2O_8+H_2O$ | 258.8 | not soluble. | | ..... |
| Lead, Acetate (see Sugar of Lead) | $Pb(C_2H_3O_2)_2,3H_2O$ | 378 | 2.5 | 2 | 1 in 12.5 |
| " Carbonate | $PbCO_4$ | 366 | n. s. | sp. s. | n. s. |
| " Iodide | $PbI_2$ | 460 | s. | s. | n. s. |
| " Nitrate | $Pb(NO_3)_2$ | 330 | 7.7 | 7 | s. |
| " Oxide | PbO | 222.4 | n. s. | n. s. | Alkalis. |
| Lithium, Bromide | LiBr | 87 | .66 | .5 | v. s. |
| " Chloride | $LiCl+H_2O$ | 60.5 | 1.3 | 1 | s. |
| " Iodide | LiI | 134 | .61 | .5 | s. |
| Magnesium, Bromide | $MgBr_2$ | 184 | 1 | .75 | s. |

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*Abbreviations.*—s., soluble; v. s., very soluble: sp. s., sparingly soluble; n. s., not soluble; dec., decomposed; del., deliquescent.

| NAME. | SYMBOL. | MOLECULAR WEIGHT. | ONE PART IS SOLUBLE IN COLD WATER. | ONE PART IS SOLUBLE IN HOT WATER. | ALCOHOL. |
|---|---|---|---|---|---|
| Magnesuim, Chloride | $MgCl_2$ | 95 | 2 | 1.5 | s. |
| " Iodide | $MgI_2$ | 246.3 | 1 | .75 | v. s. |
| " Sulphate (see Epsom Salt) | $MgSO_4,7H_2O$ | 246 | 1.3 | 1 | sp. s. |
| Manganous Chloride | $MnCl_2+4H_2O$ | 198 | s. | s. | n. s. |
| Mercury, Chloride (Mercuric) (see Corros. Subl.) | $HgCl_2$ | 271 | 19 | 3 | 5 |
| " " (Mercurous) (see Calomel) | $Hg_2Cl$ | 235.5 | n. s. | n. s. | n. s. |
| " Cyanide | $HgCy_2$ | 252 | 8 | 2 | 1 in 20 |
| " Iodide (Mercuric) | $HgI_2$ | 454 | sp. s. | sp. s. | sp. s. |
| " " (Mercurous) | $Hg_2I$ | 654 | n. s. | n. s. | n. s. |
| Metol (Mono-methyl Para-amidometakresol) | $C_8H_{11}NO$ | 137 | s. | s. | s. |
| Para-amidophenol | $C_6H_7NO$ | 109 | sp. s. | s. | ..... |
| Para-amidophenol Sodium | $C_6H_6NaNO$ | 131 | easily soluble. | | ..... |
| Para-amidophenol Hydrochlorate | $C_6H_7NOHCl$ | 145.5 | s. | s. | s. |
| Para-rosaniline (Triamido-phenyl-Carbinol) | $C_{19}H_{19}N_3O$ | 305 | ..... | ..... | ..... |
| Phenol (see Carbolic Acid) | ..... | ..... | ..... | ..... | ..... |
| Platino-potassium Chloride or Chloro-platinite of Potassium | $K_2PtCl_4$ | 417.4 | 6. | ..... | s. |
| Platino sodium Chloride or Chloro-platinite of Sodium | $Na_2PtCl_4$ | 385.4 | soluble. | | ..... |
| Platinum Chloride | $PtCl_4+5H_2O$ | 429.4 | ..... | * | ..... |
| Potassa (see Potassium Hydrate) | ..... | ..... | ..... | ..... | ..... |

* Real platinum-chloride is but little soluble in water; the article of commerce of that name answers to the formula $PtCl_4 2HCl+6H_2O$, and is of the atomic weight 520.4 (K. Schwier). It is easily soluble in water, probably in the proportion of 1:6.

| | | | | | |
|---|---|---|---|---|---|
| Potassium, Aluminium Sulphate (see Alum) | $Al_2(SO_4)_3,K_2SO_4,24H_2O$ | 948 | 10 | 8 | n. s. |
| " Bicarbonate | $KHCO_3$ | 100 | 3 | 2 | n. s. |
| " Bichromate | $K_2Cr_2O_7$ | 295 | 10 | 7 | n. s. |
| " Bromide | KBr | 119 | 2 | 1 | 1 in 90 |
| " Carbonate | $KO_2C_3+2H_2O$ | 174 | .75 | .5 | n. s. |
| " Chlorate | $KClO_3$ | 122.5 | 16 | 2 | n. s. |
| " Chloride | KCl | 74.5 | 3 | 2 | sp s. |
| " Chromic Sulph. (see Chrome Alum) | $Cr_2(SO_4)_3,K_2SO_4,24H_2O$ | 999 | 10 | dec. | n. s. |
| " Citrate | $K_3C_6H_5O_7H_2O$ | 324.3 | 6.6 | .3 | n. s. |
| " Cyanide | KCy | 65.1 | 1 | .5 | sp. s. |
| " Ferric Sulphate | $K_2SO_4,Fe_2(SO_4)_3,24H_2O$ | 100.6 | s. | s. | n. s. |
| " Ferri-cyanide (see Red Prussiate) | $K_6Fe_2Cy_{12}$ | 658.6 | 2.5 | 1.2 | n. s. |
| " Ferro-cyanide (see Yellow Pruss.) | $K_4FeCy_6$ | 368.4 | 3 | 1 | n. s. |
| " Fluoride | $KFl+2H_2O$ | 94 | v. s. | v. s. | v. s. |
| " Hydrate | KOH | 56 | .5 | .25 | sp. s. |
| " Iodide | KI | 166 | .75 | .5 | 1 in 16 |
| " Nitrate (see Saltpetre) | $KNO_3$ | 101 | 4 | 1 | n. s. |
| " Oxalate | $KC_2O_4H_2O$ | 235 | 3 | 2 | sp. s. |
| " Permanganate | $KMnO_4$ | 158 | 16 | 10 | n. s. |
| " Sulpho-cyanate | KCyS | 97 | 2 | 1 | sp. s. |
| Pyrogallo. (see Pyrogallic Acid) | | | | | |
| Rhodan (German appellation for Cyanates) | | | | | |
| Rodinal (ready-prepared Para-amido Developer) | | | | | |
| Silver, Acetate | $AgC_2H_3O^2$ | 167 | sp. s. | sp. s. | n. s. |
| " Bromide | AgBr | 188 | n. s. | n. s. | in HCl and HBr. |
| " Carbonate | $Ag_2CO_3$ | 276 | n. s. | n. s. | n. s. |
| " Chloride | AgCl | 143.5 | n. s. | n. s. | Ammonia, cyan. potass. hyposulphite of soda. |
| " Citrate | $Ag_3C_6H_5O_7$ | 513 | sp. s. | sp. s. | |
| " Fluoride | AgFl | 127 | v. s. | v. s. | v. s. |
| " Iodide | AgI | 235 | n. s. | n. s. | same as Chloride. |
| " Nitrate | $AgNO_3$ | 170 | 1 | .5 | sp. s. |

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*Abbreviations.*—s., soluble; v. s., very soluble; sp. s., sparingly soluble; n. s., not soluble; dec., decomposed; del., deliquescent.

| Name. | Symbol. | Molecular Weight. | One Part is Soluble in Cold Water. | One Part is Soluble in Hot Water. | Alcohol. |
|---|---|---|---|---|---|
| Silver, Nitrite | $AgNO_2$ | 154 | 300 | dec. | n. s. |
| " Oxalate | $Ag_2C_2O_4$ | 304 | sp. s. | s. | n. s. |
| " Oxide | $Ag_2O$ | 232 | n. s. | n. s. | n. s. |
| " Sulphide | $Ag_2S$ | 248 | n. s. | n. s. | n. s. |
| Soda, Caustic (see Sodium Hydrate) | | | | | |
| Sodium Acetate | $NaC_2H_3O_2,6H_2O$ | 190 | 3 | .66 | n. s. |
| " Biborate (Borax) | $Na_2B_4O_7,10H_2O$ | 382 | 12.5 | 2 | n. s. |
| " Bromide | $NaBr$ | 103 | 1.25 | 1 | 1:16 |
| " Bicarbonate | $NaHCO_3$ | 84 | 12 | dec. | n. s. |
| " Carbonate | $Na_2CO_3,10H_2O$ | 286 | 2 | 1 | n. s. |
| " Chloride | $NaCl$ | 58.5 | 2.75 | 2.75 | n. s. |
| " Citrate | $Na_3C_6H_5O_7$ | 258 | 1 | .5 | sp. s. |
| " Hydrate | $NaHO$ | 40 | 1.5 | .5 | sp. s. |
| " Hypo-sulphite | $Na_2S_2O_35H_2O$ | 248 | 1.5 | 1 | sp. s. |
| " Iodide | $NaI$ | 150 | .5 | .3 | sp. s. |
| " Nitrate | $NaNO_3$ | 85 | 1.36 | 1 | 1 in 37 |
| " Sulph-antimoniate or Schlippe's Salt | $NaSbS_3$ | 241 | s. | s. | n. s. |
| " Sulphate | $Na_2SO_4,10H_2O$ | 322 | 2 | 4 | s. |
| " Sulphide | $Na_2S,9H_2O$ | 240 | s. | s. | sp. s. |
| " Sulphite | $Na_2SO_3,7H_2O$ | 252 | 4 | 2 | sp. s. |
| " Tungstate | $Na_2WO_4+2H_2O$ | 326 | s. | s. | n. s. |
| " Thio-sulphate (see Hypo-sulphite) | | | | | |
| Strontium, Bromide | $SrBr_2,6H_2O$ | 355.5 | 1 | .75 | sp. s. |
| " Chloride | $SrCl_2,6H_2O$ | 266.5 | 1.8 | 1 | sp. s. |

| | | | | | |
|---|---|---|---|---|---|
| Strontium, Nitrate | $Sr(NO_3)_2$ | 211.5 | 5 | 2 | sp. s. |
| Sugar of Lead (see Lead Acetate) | | | | | |
| Tannin (see Digallic Acid) | | | | | |
| Thymol | $C_6H_3(CH_3(C_3H_7)COO$ | 177 | sp. | | and in ether. |
| Tin, Chloride (Stannic) | $SnCl_4$ | 260 | dec. | in much | water. |
| " Chloride (Stannous) | $SnCl_2,2H_2O$ | 225 | 135:100 | 655:100 | v. s. |
| Uranium, Bromide | $UBr_2,4H_2O$ | 352 | 1 | .5 | sp. s. |
| " Nitrate | $UO_2(NO_3)_2.6H_2O$ | 384 | .5 | .25 | v. s. |
| " Sulphate | $UO_3(SO_4),3H_2O$ | 302 | .5 | .25 | v. s. |
| Verdigris (see Copper Acetate) | | | | | |
| Vitriol, Blue (see Copper Sulphate) | | | | | |
| " Green (see Iron Sulphate) | | | | | |
| " White (see Zinc Sulphate) | | | | | |
| Water | $H_2O$ | 18 | | | |
| Washing Soda (see Sodium Carbonate) | | | | | |
| Wood Alcohol (see Alcohol Methyl) | | | | | |
| Zinc, Bromide | $ZnBr_2$ | 225 | del. | and e. s. | s. |
| " Chloride | $ZnCl_2$ | 136 | .33 | | s. |
| " Iodide | $ZnI_2$ | 319 | .33 | dec. | v. s. |
| " Nitrate | $Zn(NO_3)_2,6H_2O$ | 296 | del. | del. | del. |
| " Sulphate (see White Vitriol) | $ZnSO_4,7H_2O$ | 287 | 2. | 1. | n. s. |
| Zircon Earth | $Z_1O_2$ | 121.6 | n. s. | n. s. | n. s. |

## IMPURITIES IN PHOTOGRAPHIC CHEMICALS AND TESTS FOR THEM.

| Substance. | Impurities Possibly Present. | Tests. |
|---|---|---|
| Ammonia | Carbonic Acid. | Renders lime-water milky. |
| | Dissolved solid matter | Residue left on evaporation. |
| | Chlorides. | After acidulating with nitric acid, it gives a precipitate with silver nitrate, which, after washing, is readily soluble in ammonia, and re-precipitated by nitric acid. |
| | Sulphates. | After acidulating with nitric acid, it gives a precipitate with barium nitrate. |
| | Lime. | A white precipitate with oxalate of ammonium. |
| | Lead is often present, derived from the action upon flint glass bottles. | Black precipitate with sulphuretted hydrogen. |
| Nitric Acid | Traces of sulphuric acid. | After dilution it gives a precipitate with barium nitrate. |
| | Chlorides. | After dilution it gives a precipitate with silver nitrate. |
| | Peroxide of nitrogen. | The acid is yellow. |
| | Iodine may be present if the acid be prepared from sodium nitrate. | After dilution and cooling it gives a blue color with starch paste or mucilage. |
| Hydrochloric Acid | Free chlorine. | Liberates iodine from solution of potassium iodide. See also chlorides, nitric acid. |
| | Sulphuric acid. | As above for nitric acid. |
| | Perchloride of iron. | Yellow color. Brown precipitate with ammonia added till it smells slightly. |
| Hydrochloric Acid | Arsenic. | Marsh's test. |
| | Some yellow samples contain no iron, but an organic salt, and give an alkaline ash on ignition of the residue after evaporation. | Reinsh's test; a small piece of copper foil becomes coated on boiling in dilute acid. |
| Sulphuric Acid | Bisulphate of potassium. | Residue on evaporation. |
| | Sulphate of lead. | Milkiness on dilution. |
| | | May be completely freed from lead by diluting with three or four times as much water, and allowing to settle. |
| | When sold as pure, it invariably contains a trace of iron. Common acid is also liable to contain arsenic, selenium, thallium, and many other substances. | No easy test can be given, as the substances are so numerous; some of them volatile, and most require separation from the acid before detection. |
| | Organic matter, as a piece of straw in a carboy of acid. | Gives a brown color to the acid. |
| Acetic Acid | Water. | Does not solidify when cooled to 17° C, (53° F.) |
| | Sulphurous and hydrochloric acids. | White precipitate with silver nitrate. |
| | Aldehyde, or volatile tarry matter. | Blackens in the light after adding silver nitrate. |
| | Organic sulphuric acid. | Smell of garlic. |
| Citric Acid | Tartaric acid. | Strong solution of potassium acetate added to a strong solution of the acid will deposit white crystalline bitartrate. |
| Pyrogallic Acid | Metagallic acid. | Black residue insoluble in water. |
| Silver Nitrate | Free nitric acid. | Reddens litmus paper (neutral silver nitrate does not affect litmus). |
| Potassium Carbonate | Chlorides and sulphates. | Same as for ammonia. |
| Potassium Iodide | Potassium carbonate. | A strong solution is alkaline to test paper. |
| | Sulphates and chlorides. | Same as for ammonia. |
| | Potassium iodate. | A pretty strong solution becomes yellow from liberation of iodine on addition of dilute sulphuric acid, or better, a strong solution of citric acid. |

## IMPURITIES IN PHOTOGRAPHIC CHEMICALS AND TESTS FOR THEM.—*Continued.*

| Substance. | Impurities Possibly Present. | Test. |
|---|---|---|
| Potassium Bromide | Similar to potassium iodide. | See potassium iodide. |
| Sodium Carbonate | Chlorides and sulphates. | Same as for ammonia. |
| Sodium Chloride | Chloride of calcium. | Oxalate of ammonium (after addition of a little acetic acid) gives a milkiness or precipitate, indicating calcium; filter this out, and add ammonia, chloride of ammonium, and phosphate of sodium (clear solutions). A precipitate indicates magnesium. Both the above cause dampness in wet weather. |
| | Chloride of magnesium. | |
| | Sodium sulphate. | As for sulphates in ammonia. |
| Potassium Cyanide | Potassium carbonate nearly always present. | Effervescence with dilute acids, giving off a gas carbonic anhydride, which renders lime water turbid. |
| Potassium Hydrate | | |
| Kaolin | Chalk. | Effervescence with dilute acids. |
| Water | Sulphates and chlorides. | Same as for ammonia. |
| | Calcium carbonate, temporary hardness. | Deposited by boiling. |
| | Ammonia, almost always present in distilled and rain water. | Test as for calcium chloride, see sodium chloride. |
| | | Brown coloration, or precipitate with Nessler's re-agent. |
| Gelatine | Alum. | Ash, sometimes as much as 10 per cent. |
| | Fatty matter. | Separated by precipitation with alcohol. Dissolved out by ether or benzine, and left as a residue on evaporation of the solvent. |
| Ammonium Bromide | Potassium bromide, or other non-volatile bodies. | Leaves a residue when heated. |
| | Ammonium chloride. | Same as for chlorides in ammonia. |
| Pyrogallic Acid | Powdered glass. | Left behind on solution. |
| Potassium Iodide | Potassium bromide. | The crystals of bromide are usually more transparent than those of iodide, but no reliance can be placed on this. |
| Silver Nitrate | Potassium nitrate, sometimes present in the fused sticks, not in the crystals. | Will not yield the full quantity of chloride on precipitation with HCl. Gives a purple color to flame. |
| Calcium Chloride | Calcium hydrate. | The clear filtered solution made with distilled water is alkaline to test paper, and gives a precipitate on breathing into it through a tube. |
| Pure Chemicals generally. | Broken glass, bits of straw, wood, paper, &c. | These impurities either float or sink on the solution, and may easily be seen. |

## PERCENTAGE OF REAL AMMONIA IN SOLUTIONS OF DIFFERENT DENSITIES AT 14° CENTIGRAD.—CARIUS.

| Specific Gravity. | Percent'ge Ammonia. | Specific Gravity. | Percent'ge Ammonia. | Specific Gravity, | Percent'ge Ammonia. | Specific Gravity. | Percent'ge Ammonia. |
|---|---|---|---|---|---|---|---|
| 0.8844 | 36.0 | 0.9052 | 27.0 | 0.9314 | 18.0 | 0.9631 | 9.0 |
| 0.8864 | 35.0 | 0.9078 | 26.0 | 0.9347 | 17.0 | 0.9670 | 8.0 |
| 0.8885 | 34.0 | 0.9106 | 25.0 | 0.9380 | 16.0 | 0.9709 | 7.0 |
| 0.8907 | 33.0 | 0.9133 | 24.0 | 0.9414 | 15.0 | 0.9749 | 6.0 |
| 0.8929 | 32.0 | 0.9162 | 23.0 | 0.9449 | 14.0 | 0.9790 | 5.0 |
| 0.8953 | 31.0 | 0 9191 | 22.0 | 0.9484 | 13.0 | 0.9831 | 4.0 |
| 0.8976 | 30.0 | 0.9221 | 21.0 | 0.9520 | 12.0 | 0.9873 | 3.0 |
| 0.9001 | 29.0 | 0.9251 | 20.0 | 0.9556 | 11.0 | 0.9915 | 2.0 |
| 0.9026 | 28.0 | 0.9283 | 19.0 | 0.9593 | 10.0 | 0.9959 | 1.0 |

## SOLUBILITY OF THE SILVER HALOIDS. By E. Valenta.

In the *Photographic Society's Journal* the following table, the result of a series of experiments, is given.

| Solvent. | Concentration. | 100 g. of solution can dissolve in grammes. | | | Remarks. |
|---|---|---|---|---|---|
| | | Ag Cl. | Ag Br. | Ag I. | |
| Sodium hyposulphite | 1 : 100 | 0.40 | 0.35 | 0.03 | The estimations were made at 20° C. |
| " " | 5 : 100 | 2.00 | 1.90 | 0.15 | |
| " " | 10 : 100 | 4.10 | 3.50 | 0.30 | |
| " " | 15 : 100 | 5.50 | 4.20 | 0.40 | |
| " " | 20 : 100 | 6.10 | 5.80 | 0.60 | |
| Ammonium hyposulphite | 1 : 100 | 0.57 | .... | .... | For bromide and iodide of silver similar results were obtained as with sodium hyposulphite. |
| " " | 5 : 100 | 1.32 | .... | .... | |
| " " | 10 : 100 | 3.92 | .... | .... | |
| Sodium sulphite | 10 : 100 | 0.44 | 0.04 | 0.01 | |
| " " | 20 : 100 | 0.95 | 0.08 | 0.02 | |
| Ammonium sulphite | 10 : 100 | | traces | | |
| Ammonium carbonate | 10 : 100 | 0.05 | .... | .... | |
| Ammonia | 3% | 1.40 | .... | .... | |
| " | 15% | 7.58 | .... | .... | |
| Magnesium chloride | 50 : 100 | 0.50 | .. | ... | |
| Potassium cyanide | 5 : 100 | 2.75 | 6.55 | 8.23 | 25° C. |
| Ammonium sulphocyanide | 5 : 100 | 0.08 | 0.21 | 0.02 | 23° C. |
| " " | 10 : 100 | 0.54 | 2.04 | 0.08 | |
| " " | 15 : 100 | 2.88 | 5.30 | 0.13 | |
| Potassium sulphocyanide | 10 : 100 | 0.11 | 0.73 | .... | 25° C. |
| Calcium sulphocyanide | 10 : 100 | 0.15 | 0.53 | 0.03 | |
| Barium sulphocyanide | 10 : 100 | 0.20 | 0.35 | 0.02 | |
| Aluminium sulphocyanide | 10 : 100 | 2.02 | 4.50 | 0.02 | |
| Thiocarbamide | 10 : 100 | 0.83 | 1.87 | 0.79 | 25° C. |
| Thiosinamin | 1 : 100 | 0.40 | 0.08 | 0.008 | |
| " | 5 : 100 | 1.90 | 0.35 | 0.05 | |
| " | 10 : 100 | 3.90 | 0.72 | 0.09 | |

# TABLE OF EQUIVALENT QUANTITIES OF SOME HALOIDS USED IN PHOTOGRAPHY.

CALCULATED FOR THE ANHYDROUS AND DRY SALTS.

By A. B. AUBERT, Professor of Chemistry, Maine State College, Orono, Me.

†EQUIVALENT QUANTITIES OF VARIOUS CHLORIDES USED IN PHOTOGRAPHY.

| Sodium Chloride. | Potassium Chloride. | Ammonium Chloride. | Lithium Chloride. | Cadmium Chloride. |
|---|---|---|---|---|
| 1 | 1.275 | 0.914 | 0.726 | 1.564 |
| 0.784 | 1 | 0.717 | 0.569 | 1.226 |
| 1.093 | 1.394 | 1 | 0.794 | 1.710 |
| 1.376 | 1.755 | 1.258 | 1 | 2.152 |
| 0.639 | 0.818 | 0.584 | 0.464 | 1 |

†EQUIVALENT QUANTITIES OF VARIOUS BROMIDES USED IN PHOTOGRAPHY.

| Bromine. | Ammonium Bromide. | Potassium Bromide. | Sodium Bromide. | Cadmium Bromide + 4 Equi. Water. | Zinc Bromide. |
|---|---|---|---|---|---|
| 1 | 1.225 | 1.488 | 1.287 | 2.150 | 1.406 |
| 0.816 | 1 | 1.214 | 1.055 | 1.754 | 1.147 |
| 0.672 | 0.823 | 1 | 0.865 | 1.445 | 0.945 |
| 0.777 | 0.952 | 1.156 | 1 | 1.671 | 1.092 |
| 0.465 | 0.570 | 0.692 | 0.599 | 1 | 0.654 |
| 0.711 | 0.871 | 1.058 | 0.915 | 1.529 | 1 |

†EQUIVALENT QUANTITIES OF VARIOUS IODIDES USED IN PHOTOGRAPHY.

| Iodine. | Ammonium Iodide. | Potassium Iodide. | Sodium Iodide. | Cadmium Iodide. | Zinc Iodide. |
|---|---|---|---|---|---|
| 1 | 1.142 | 1.307 | 1.181 | 1.441 | 1.255 |
| 0.876 | 1 | 1.145 | 1.035 | 1.262 | 1.099 |
| 0.765 | 0.874 | 1 | 0.903 | 1.102 | 0.960 |
| 0.847 | 0.967 | 1.107 | 1 | 1.220 | 1.063 |
| 0.694 | 0.793 | 0.907 | 0.820 | 1 | 0.871 |
| 0.797 | 0.910 | 1.042 | 0.941 | 1.148 | 1 |

†EQUIVALENT QUANTITIES OF VARIOUS SILVER SALTS USED IN PHOTOGRAPHY.

| Silver (Metallic). | Nitrate. | Chloride. | Bromide. | Iodide. |
|---|---|---|---|---|
| 1 | 1.574 | 1.328 | 1.741 | 2.176 |
| 0.6353 | 1 | 0.844 | 1.106 | 1.382 |
| 0.7523 | 1.184 | 1 | 1.310 | 1.638 |
| 0.5744 | 0.904 | 0.763 | 1 | 1.250 |
| 0.4595 | 0.723 | 0.610 | 0.800 | 1 |

†EQUIVALENT QUANTITES OF VARIOUS GOLD SALTS USED IN PHOTOGRAPHY.

| Gold (Metallic). | Chloride. | Double Chloride of Gold and Potassium. | Double Chloride of Gold and Sodium. |
|---|---|---|---|
| 1 | 1.542 | 2.1048 | 2.0229 |
| 0.6485 | 1 | 1.3645 | 1.3119 |
| 0.4751 | 0.7326 | 1 | 0.9611 |
| 0.4943 | 0.7623 | 1.0405 | 1 |

† Translated and partly recalculated from the "Agenda du Chimiste."

# ACKLAND'S TABLES FOR THE SIMPLIFICATION OF EMULSION CALCULATIONS.

No. 1.

| | Equivalent weights. | Weight of $AgNO_3$ required to convert one grain of soluble haloid. | Weight of soluble haloid required to convert one grain $AgNO_3$. | Weight of silver haloid produced by one grain of soluble haloid. | Weight of soluble haloid required to produce one grain of silver haloid. | Weight of silver haloid produced from one grain $AgNO_3$. |
|---|---|---|---|---|---|---|
| Ammonium bromide..... | 98 | 1.734 | .576 | 1.918 | .521 | |
| Potassium " ..... | 119.1 | 1.427 | .700 | 1.578 | .633 | |
| Sodium " ..... | 103 | 1.650 | .606 | 1.825 | .548 | |
| Cadmium " com... | 172 | .988 | 1.012 | 1.093 | .915 | 1.106 |
| " " anh.... | 136 | 1.25 | .800 | 1.382 | .723 | |
| Zinc " ..... | 112.1 | 1.509 | .663 | 1.670 | .600 | |
| Ammonium chloride..... | 53.5 | 3.177 | .315 | 2.682 | .373 | |
| Sodium " ..... | 58.5 | 2.906 | .344 | 2.453 | .408 | .844 |
| Ammonium iodide..... | 145 | 1.172 | .853 | 1.620 | .617 | |
| Potassium " ..... | 166.1 | 1.023 | .977 | 1.415 | .707 | |
| Sodium " ..... | 150 | 1.133 | .882 | 1.566 | .638 | 1.382 |
| Cadmium " ..... | 183 | .929 | 1.076 | 1.284 | .778 | |

Table No. 1 presents the actual weights of haloid or silver, as the case may be, required to convert or combine with one grain of another.

In order to make (say) ten ounces of emulsion by a new formula, which, for the sake of showing the working of the table, we will write down as follows :

| | |
|---|---|
| Bromide of potassium..... | 150 grains. |
| Iodide of potassium..... | 10 " |
| Chloride of ammonium..... | 10 " |
| Gelatine..... | 200 " |

we want to know how much silver nitrate should be employed in sensitizing this mixture. For this purpose we use the first column, in which we find against each haloid the exact quantity of silver nitrate required to fully decompose one grain. Taking, then, the figures we find in column No. 1 against the three salts in the above formula, and multiplying them by the number of grains of each used, we have the following sum :

| | | |
|---|---|---|
| Potassium bromide..... | $150 \times 1.427 = 214$ | Weight |
| " iodide..... | $10 \times 1.023 = 10.23$ | silver nitrate |
| Chloride of ammonium..... | $10 \times 3.177 = 31.77$ | required. |

or the total quantity of silver nitrate required for full conversion, 256.00 grains.



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A PORTRAIT STUDY.

By JAMES L. BREESE.

# ACKLAND'S TABLES FOR THE SIMPLIFICATION OF EMULSION CALCULATIONS.

No. 2.

| | Ammonium bromide. | Potassium bromide. | Sodium bromide. | Cadmium bromide. (Coml.) | Cadmium bromide. (Anhyd.) | Zinc bromide. | Ammonium chloride. | Sodium chloride. | Ammonium iodide. | Potassium iodide. | Sodium iodide. | Cadmium iodide. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ammonium bromide ..... | **1** | .823 | .951 | .57 | .72 | .87 | 1.832 | 1.675 | .676 | .59 | .653 | .535 |
| Potassium " .... | 1.215 | **1** | 1.156 | .692 | .876 | 1.058 | 2.226 | 2.036 | .821 | .717 | .794 | .651 |
| Sodium " ..... | 1.051 | .865 | **1** | .599 | .757 | .915 | 1.925 | 1.761 | .71 | .62 | .686 | .563 |
| Cadmium " com. | 1.755 | 1.444 | 1.67 | **1** | 1.265 | 1.527 | 3.215 | 2.94 | 1.186 | 1.035 | 1.146 | .94 |
| " " anh. | 1.387 | 1.141 | 1.32 | .79 | **1** | 1.207 | 2.542 | 2.324 | .938 | .819 | .906 | .743 |
| Zinc " ..... | 1.149 | .945 | 1.093 | .655 | .828 | **1** | 2.104 | 1.925 | .776 | .678 | .75 | .615 |
| Ammonium chloride..... | .546 | .449 | .519 | .311 | .393 | .475 | **1** | .914 | .369 | .322 | 356 | .292 |
| Sodium " ..... | .597 | .491 | .568 | .34 | .43 | .519 | 1.093 | **1** | .403 | .352 | .39 | .319 |
| Ammonium iodide ..... | 1.479 | 1.217 | 1.408 | .843 | 1.066 | 1.287 | 2.712 | 2.478 | **1** | .873 | .966 | .792 |
| Potassium " ..... | 1.695 | 1.394 | 1.612 | .965 | 1.221 | 1.475 | 3.104 | 2.839 | 1.145 | **1** | 1.107 | .907 |
| Sodium " ..... | 1.53 | 1.259 | 1.456 | .872 | 1.103 | 1.332 | 2.803 | 2.564 | 1.034 | .903 | **1** | .819 |
| Cadmium " ..... | 1.867 | 1.536 | 1.776 | 1.064 | 1.345 | 1.625 | 3.42 | 3.128 | 1.262 | 1.102 | 1.22 | **1** |

TABLE No. 2 gives in separate columns the relative converting values of each of the soluble haloid salts in ordinary use, showing how much of any salt must be used to replace one grain of any other. In each column will be found a unit (printed in larger type) which represents one grain of the salt named at the head of the column; the other figures in the same column show the exact quantities of the other salts which must be used in lieu of a single grain of that particular haloid. Thus, taking the first column, which is headed "Ammonium Bromide," we find against ammonium bromide in the margin the figure 1, representing one grain of that salt. If we wish to know the relative converting power of potassium bromide we take the number in the same column which stands against the latter salt in the margin, viz., 1.215; that is to say, 1.215 grain of potassium bromide will be required to do the same work as one of $NH_4$ Br.

# ELSDEN'S TABLE OF POISONS AND ANTIDOTES.

| | Poisons. | Remarks. | Characteristic Symptoms. | Antidote. |
|---|---|---|---|---|
| Caustic Vegetable Alkalies. | Oxalic Acid. including Potassium Oxalate. | 1 dram is the smallest fatal dose known. | Hot, burning sensation in throat and stomach; vomiting, cramps, and numbness. | Chalk, whiting or magnesia, suspended in water. Plaster or mortar can be used in emergency. |
| | Ammonia. | Vapor of ammonia may cause inflammation of the lungs. | Swelling of tongue, mouth, and fauces; often followed by stricture of the œsophagus. | Vinegar and water. |
| | Potash. Soda. | | | |
| Metallic Salts. | Mercuric Chloride. | 3 grains the smallest known fatal dose. | Acrid, metallic taste, constriction and burning in throat and stomach, followed by nausea and vomiting. | White and yolk of raw eggs with milk. In emergency, flour paste may be used. |
| | Acetate of Lead. | The sub-acetate is still more poisonous. | Constriction in the throat and at pit of stomach; crampy pains and stiffness of abdomen; blue line round the gums. | Sulphates of soda or magnesia. Emetic of sulphate of zinc. |
| | Cyanide of Potassium. | *a*. Taken internally, 3 grs. fatal. | Insensibility, slow, gasping respiration, dilated pupils, and spasmodic closure of the jaws. | No certain remedy; cold affusion over the head and neck most efficacious. |
| | | *b*. Applied to wounds and abrasures of the skin. | Smarting sensation. | Sulphate of iron should be applied immediately. |
| | Bichromate of Potassium | *a*. Taken internally. | Irritant pain in stomach, and vomiting. | Emetics and magnesia, or chalk. |
| | | *b*. Applied to slight abrasions of the skin. | Produces troublesome sores and ulcers. | |
| | Nitrate of Silver. | | Powerful irritant. | Common salt to be given immediately, followed by emetics. |
| Concentrated Mineral Acids. | Nitric Acid. | 2 drams have been fatal. Inhalation of the fumes has also been fatal. | Corrosion of windpipe and violent inflammation. | Bicarbonate of soda, or carbonate of magnesia or chalk, plaster of the apartment beaten up in water. |
| | Hydrochloric Acid. | ½ ounce has caused death. | | |
| | Sulphuric Acid. | 1 dram has been fatal. | | |
| | Acetic Acid, concentrated, has as powerful an effect as the mineral acids. | | | |
| | Iodine. | Variable in its action; 3 grains have been fatal. | Acrid taste, tightness about the throat, vomiting. | Vomiting should be encouraged, and gruel, arrowroot and starch given freely. |
| | Ether. | When inhaled. | Effects similar to chloroform. | Cold affusion and artificial respiration. |
| | Pyrogallol. | 2 grains sufficient to kill a dog. | Resemble phosphorus poisoning. | No certain remedy. Speedy emetic desirable. |

# UNITED STATES WEIGHTS AND MEASURES.

## ACCORDING TO EXISTING STANDARDS.

### LINEAL.

| | Inches. | Feet. | Yards. | Rods. | Fur's. | Mile. |
|---|---|---|---|---|---|---|
| 12 inches = 1 foot. | 12 = | 1 | | | | |
| 3 feet = 1 yard. | 36 = | 3 = | 1 | | | |
| 5.5 yards = 1 rod. | 198 = | 16.5 = | 5.5 = | 1 | | |
| 40 rods = 1 furlong. | 7,920 = | 660 = | 220 = | 40 = | 1 | |
| 8 furlongs = 1 mile. | 63,360 = | 5,280 = | 1,760 = | 320 = | 8 = | 1 |

### SURFACE—LAND.

| | Feet. | Yards. | Rods. | Roods. | Acres. |
|---|---|---|---|---|---|
| 144 sq. ins. = 1 sq. ft. | 9 = | 1 | | | |
| 9 sq. ft. = 1 sq. yard. | 272.25 = | 30.25 = | 1 | | |
| 30.25 sq. yds. = 1 sq. rod. | 10,890 = | 1,210 = | 40 = | 1 | |
| 40 sq. rods = 1 sq. rood. | 43,560 = | 4,840 = | 160 = | 4 = | 1 |
| 4 sq. roods = 1 acre. | 27,878,400 = | 3,097,600 = | 102,400 = | 2,560 = | 640 |
| 640 acres = 1 sq. mile. | | | | | |

### VOLUME—LIQUID.

4 gills = 1 pint.
2 pints = 1 quart.
4 quarts = 1 gallon.

| Gills. | Pints. | Gallon. | Cub. In. |
|---|---|---|---|
| 32 = | 8 = | 1 = | 231 |

### FLUID.

| Gallon. | Pints. | Ounces. | Drachms. | Minims. | Cubic Centimetres. |
|---|---|---|---|---|---|
| 1 = | 8 = | 128 = | 1,024 = | 61,440 = | 3,785,435 |
| | 1 = | 16 = | 128 = | 7,680 = | 473,179 |
| | | 1 = | 8 = | 480 = | 29,574 |
| | | | 1 = | 60 = | 3,697 |

16 ounces, or a pint, is sometimes called a fluid pound.

### TROY WEIGHT.

| Pound. | Ounces. | Pennyweights. | Grains. | Grams. |
|---|---|---|---|---|
| 1 = | 12 = | 240 = | 5,760 = | 373.24 |
| | 1 = | 20 = | 480 = | 31.10 |
| | | 1 = | 24 = | 1.56 |

### APOTHECARIES' WEIGHT.

| lb. Pound. | ℥ Ounces. | ʒ Drachms. | ℈ Scruples. | gr. Grains. | Grams. |
|---|---|---|---|---|---|
| 1 = | 12 = | 96 = | 288 = | 5,760 = | 373.24 |
| | 1 = | 8 = | 24 = | 480 = | 31.10 |
| | | 1 = | 3 = | 60 = | 3.89 |
| | | | 1 = | 20 = | 1.30 |
| | | | | 1 = | .06 |

The pound, ounce, and grain are the same as in Troy weight.

### AVOIRDUPOIS WEIGHT.

| Pound. | Ounces. | Drachms. | Grains (Troy). | Grams. |
|---|---|---|---|---|
| 1 = | 16 = | 256 = | 7,000 = | 453.60 |
| | 1 = | 16 = | 437.5 = | 28.35 |
| | | 1 = | 27.34 = | 1.77 |

## ENGLISH WEIGHTS AND MEASURES.

### APOTHECARIES' WEIGHT.

20 Grains = 1 Scruple = 20 Grains.
3 Scruples = 1 Drachm = 60 Grains.
8 Drachms = 1 Ounce = 480 Grains.
12 Ounces = 1 Pound = 5760 Grains.

FLUID MEASURE.

60 Minims = 1 Fluid Drachm
8 Drachms = 1 Fluid Ounce.
20 Ounces = 1 Pint.
8 Pints = 1 Gallon.

The above weights are usually adopted in formulas.

All Chemicals are usually sold by

### AVOIRDUPOIS WEIGHT.

$27\frac{11}{32}$ Grains = 1 Drachm = $27\frac{11}{32}$ Grains.
16 Drachms = 1 Ounce = $437\frac{1}{2}$ Grains.
16 Ounces = 1 Pound = 7000 Grains.

Precious Metals are usually sold by

### TROY WEIGHT.

24 Grains = 1 Pennyweight = 24 Grains.
20 Pennyweights = 1 Ounce = 480 Grains.
12 Ounces = 1 Pound = 5760 Grains.

NOTE.—An ounce of metallic silver contains 480 grains, but an ounce of nitrate of silver contains only $437\frac{1}{2}$ grains.

## UNITED STATES FLUID MEASURE.

| Gal. | Pints. | Ounces. | Drachms. | Mins. | Cub. In. | Grains. | Cub. C.M. |
|---|---|---|---|---|---|---|---|
| 1 = | 8 = | 128 = | 1,024 = | 61,440 = | 231. = | 58,328.886 = | 3,785.44 |
| | 1 = | 16 = | 128 = | 7,680 = | 28.875 = | 7,291.1107 = | 473.18 |
| | | 1 = | 8 = | 480 = | 1.8047 = | 455.6944 = | 29.57 |
| | | | 1 = | 60 = | 0.2256 = | 56.9618 = | 3.70 |

## IMPERIAL BRITISH FLUID MEASURE.

| Gal. | Pints. | Ounces. | Drachms. | Mins. | Cub. In. | Grains. | Cub. C.M. |
|---|---|---|---|---|---|---|---|
| 1 = | 8 = | 160 = | 1,280 = | 76,800 = | 277.27384 = | 70,000 = | 4,543.732 |
| | 1 = | 20 = | 160 = | 9,600 = | 34.65923 = | 8,750 = | 567.966 |
| | | 1 = | 8 = | 480 = | 1.73296 = | 437.5 = | 28.398 |
| | | | 1 = | 60 = | 0.21662 = | 54.69 = | 3.550 |

# METRIC SYSTEM OF WEIGHTS AND MEASURES.

## MEASURES OF LENGTH.

| Denominations and Values. | | Equivalents in Use. |
|---|---|---|
| Myriameter | 10,000 meters. | 6.2137 miles. |
| Kilometer | 1,000 meters. | .62137 mile, or 3,280 ft. 10 in. |
| Hectometer | 100 meters. | 328. feet and 1 inch. |
| Dekameter | 10 meters. | 393.7 inches. |
| Meter | 1 meter. | 39.37 inches. |
| Decimeter | 1-10th of a meter. | 3.937 inches. |
| Centimeter | 1-100th of a meter. | .3937 inch. |
| Millimeter | 1-1000th of a meter. | .0394 inch. |

## MEASURES OF SURFACE.

| Denominations and Values. | | Equivalents in Use. |
|---|---|---|
| Hectare | 10,000 square meters. | 2.471 acres. |
| Are | 100 square meters. | 119.6 square yards. |
| Centare | 1 square meter. | 1,550. square inches. |

## MEASURES OF VOLUME.

| Denominations and Values. | | | Equivalents in Use. | |
|---|---|---|---|---|
| Names. | No. of Liters. | Cubic Measures. | Dry Measure. | Wine Measure. |
| Kiloliter or stere | 1,000 | 1 cubic meter. | 1.308 cubic yards. | 264.17 gallons. |
| Hectoliter | 100 | 1-10th cubic meter. | 2 bu. and 3.35 pecks. | 26.417 gallons. |
| Dekaliter | 10 | 10 cubic decimeters. | 9.08 quarts. | 2.6417 gallons. |
| Liter | 1 | 1 cubic decimeter. | .908 quart. | 1.0567 quarts. |
| Deciliter | 1-10 | 1-10th cubic decimeter. | 6.1023 cubic inches. | .845 gill. |
| Centiliter | 1-100 | 10 cubic centimeters. | .6102 cubic inch. | .338 fluid oz. |
| Milliliter | 1-1000 | 1 cubic centimeter. | .061 cubic inch. | .27 fl. drm. |

## WEIGHTS.

| Denominations and Values. | | | Equivalents in Use. |
|---|---|---|---|
| Names. | Number of Grams. | Weight of Volume of Water at its Maximum Density. | Avoirdupois Weight. |
| Millier or Tonneau | 1,000,000 | 1 cubic meter. | 2204.6 pounds. |
| Quintal | 100,000 | 1 hectoliter. | 220.46 pounds. |
| Myriagram | 10,000 | 10 liters. | 22.046 pounds. |
| Kilogram or Kilo | 1,000 | 1 liter. | 2.2046 pounds. |
| Hectogram | 100 | 1 deciliter. | 3.5274 ounces. |
| Dekagram | 10 | 10 cubic centimeters. | .3527 ounce. |
| Gram | 1 | 1 cubic centimeter. | 15.432 grains. |
| Decigram | 1-10 | 1-10th of a cubic centimeter. | 1.5432 grain. |
| Centigram | 1-100 | 10 cubic millimeters. | .1543 grain. |
| Milligram | 1-1000 | 1 cubic millimeter. | .0154 grain. |

*For measuring surfaces*, the square dekameter is used under the term of ARE; the hectare, or 100 ares, is equal to about 2½ acres. *The unit of capacity* is the cubic decimeter or LITER, and the series of measures is formed in the same way as in the case of the table of lengths. The cubic meter is the unit of measure for solid bodies, and is termed STERE. *The unit of weight* is the GRAM, which is the weight of one cubic centimeter of pure water weighed in a vacuum at the temperature of 4 deg. Cent. or 39.2 deg. Fahr., which is about its temperature of maximum density. In practice, the term cubic centimeter, abbreviated c.c, is generally used instead of milliliter, and cubic meter instead of kiloliter.

## METRIC SYSTEM OF WEIGHTS AND MEASURES.

THE meter is a measure of length equal to 39.370 English or American inches, a standard of linear measure supposed to be the ten-millionth part of the distance from the equator to the north pole, as ascertained by actual measurement of an arc of the meridian.

This system, formed on the meter as the unit of length, has four other leading units, all connected with and dependent upon this. Hence, we have:

1. The meter, which is the unit of measures of length.

2. The are, which is the unit of surface, and is the square of the meter.

3. The liter, which is the unit of measures of capacity, and is the cube of a tenth part of the meter.

4. The stere, which is the unit of measures of solidity, having the capacity of a cubic meter.

5. The gram, which is the unit of measures of weight, and is the weight of that quantity of distilled water at its maximum density, fills the cube of a hundredth part of the meter.

Each unit has its decimal multiples and sub-multiples, that is weights and measures ten times larger, or ten times smaller, than the principal units. The prefixes denoting multiples are derived from the Greek, and are: Deka, ten; hecto, hundred; kilo, thousand; and myria, ten thousand. Those denoting sub-multiples are taken from the Latin, and are: Deci, ten; centi, hundred (as in centigram or centimeter); and milli, thousand.

The metric system has been adopted by many nations, the English excepted. In America its use has been made optional, but is legalized by Congress. All photographic formulas received from the continent of Europe express values and quantities with metrical weights and measures. To utilize them directly without translating into the expressions of the English system, the student is advised to procure gram weights and cubic centimeter graduates, and substitute them for those denoting quantities according to the old plan.

As an assistance to those who cannot acquire these aids, we annex tables, which convert grams and cubic centimeters into English grains, drachms, and ounces sufficiently correct for practical purposes.

### METRIC FLUID MEASURES.

The cubic centimeter, usually represented by "C.c.," is the unit of the metric measurement for liquids. It contains 17 minims of water. The weight of this quantity of water is 1 gram. The following table will prove to be sufficiently accurate for photographic purposes:

## THE CONVERSION OF FRENCH (METRIC) INTO ENGLISH MEASURE.

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | cubic centimeter | = | 17 | minims. | | | | | | |
| 1 | cubic centimeters | = | 34 | " | | | | | | |
| 3 | " | = | 51 | " | | | | | | |
| 4 | " | = | 68 | " | or | 1 | dram | 8 | minims. | |
| 5 | " | = | 85 | " | " | 1 | " | 25 | " | |
| 6 | " | = | 101 | " | " | 1 | " | 41 | " | |
| 7 | " | = | 118 | " | " | 1 | " | 58 | " | |
| 8 | " | = | 135 | " | " | 2 | drams | 15 | " | |
| 9 | " | = | 152 | " | " | 2 | " | 32 | " | |
| 10 | " | = | 169 | " | " | 2 | " | 49 | " | |
| 20 | " | = | 338 | " | " | 5 | " | 38 | " | |
| 30 | " | = | 507 | " | " | 1 | ounce | 0 | dram | 27 minims |
| 40 | " | = | 676 | " | " | 1 | " | 3 | drams | 16 " |
| 50 | " | = | 845 | " | " | 1 | " | 6 | " | 5 " |
| 60 | " | = | 1014 | " | " | 2 | ounces | 0 | " | 54 " |
| 70 | " | = | 1183 | " | " | 2 | " | 3 | " | 43 " |
| 80 | " | = | 1352 | " | " | 2 | " | 6 | " | 32 " |
| 90 | " | = | 1521 | " | " | 3 | " | 1 | " | 21 " |
| 100 | " | = | 1690 | " | " | 3 | " | 4 | " | 10 " |
| 1000 | " | = | 1 liter = 34 fluid ounces nearly, or $2\frac{1}{8}$ pints. | | | | | | | |

## THE CONVERSION OF FRENCH (METRIC) INTO ENGLISH WEIGHT.

THE following table, which contains no error greater than one-tenth of a grain, will suffice for most practical purposes:

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | gram | = | $15\frac{2}{5}$ | grains. | | | | | |
| 2 | grams | = | $30\frac{4}{5}$ | " | | | | | |
| 3 | " | = | $46\frac{1}{5}$ | " | | | | | |
| 4 | " | = | $61\frac{4}{5}$ | " | ..... or | 1 | dram | $1\frac{4}{5}$ | grain. |
| 5 | " | = | $77\frac{1}{5}$ | " | ..... " | 1 | " | $17\frac{1}{5}$ | grains. |
| 6 | " | = | $92\frac{3}{5}$ | " | ..... " | 1 | " | $32\frac{3}{5}$ | " |
| 7 | " | = | 108 | " | ..... " | 1 | " | 48 | " |
| 8 | " | = | $123\frac{2}{5}$ | " | ..... " | 2 | drams | $3\frac{2}{5}$ | " |
| 9 | " | = | $138\frac{4}{5}$ | " | ..... " | 2 | " | $18\frac{4}{5}$ | " |
| 10 | " | = | $154\frac{2}{5}$ | " | ..... " | 2 | " | $34\frac{2}{5}$ | " |
| 11 | " | = | $169\frac{4}{5}$ | " | ..... " | 2 | " | $49\frac{4}{5}$ | " |
| 12 | " | = | $185\frac{1}{5}$ | " | ..... " | 3 | " | $5\frac{1}{5}$ | " |
| 13 | " | = | $200\frac{3}{5}$ | " | ..... " | 3 | " | $20\frac{3}{5}$ | " |
| 14 | " | = | 216 | " | ..... " | 3 | " | 36 | " |
| 15 | " | = | $231\frac{2}{5}$ | " | ..... " | 3 | " | $51\frac{2}{5}$ | " |
| 16 | " | = | 247 | " | ..... " | 4 | " | 7 | " |
| 17 | " | = | $262\frac{2}{5}$ | " | ..... " | 4 | " | $22\frac{2}{5}$ | " |
| 18 | " | = | $277\frac{4}{5}$ | " | ..... " | 4 | " | $37\frac{4}{5}$ | " |
| 19 | " | = | $293\frac{1}{5}$ | " | ..... " | 4 | " | $53\frac{1}{5}$ | " |
| 20 | " | = | $308\frac{3}{5}$ | " | ..... " | 5 | " | $8\frac{3}{5}$ | " |
| 30 | " | = | 463 | " | ..... " | 7 | " | 43 | " |
| 40 | " | = | $617\frac{1}{5}$ | " | ..... " | 10 | " | $17\frac{1}{5}$ | " |
| 50 | " | = | $771\frac{3}{5}$ | " | ..... " | 12 | " | $51\frac{3}{5}$ | " |
| 60 | " | = | 926 | " | ..... " | 15 | " | 26 | " |
| 70 | " | = | $1080\frac{1}{5}$ | " | ..... " | 18 | " | $0\frac{1}{5}$ | " |
| 80 | " | = | $1234\frac{3}{5}$ | " | ..... " | 20 | " | $34\frac{3}{5}$ | " |
| 90 | " | = | 1389 | " | ..... " | 23 | " | 9 | " |
| 100 | " | = | $1543\frac{1}{5}$ | " | ..... " | 25 | " | $43\frac{1}{5}$ | " |
| 1000 | " | = | 1 kilogram = 32 oz., 1 dr., $12\frac{2}{5}$ gr. | | | | | | |

# THE CONVERSION OF METRIC INTO AMERICAN MEASURE.

By Nelson B. Sizer, B.Sc., M.D.

[From *The Photographic Times*, August 14, 1891.]

The following table is computed true to the nearest half grain or minim, as the case may be, so it will prove a sufficiently near approximation to the required metric equivalents.

U. S. P. Standard.

| Gram, or c.cm. | Grains. | Minims. | Gram, or c.cm. | Grains. | Minims. |
|---|---|---|---|---|---|
| 1 | 15½ | 16½ | 15 | 231½ | 244 |
| 2 | 31 | 32½ | 16 | 247 | 260 |
| 3 | 46 | 49 | 17 | 262 | 276 |
| 4 | 62 | 65 | 18 | 278 | 292½ |
| 5 | 77 | 81 | 19 | 293 | 309 |
| 6 | 93 | 97½ | 20 | 308½ | 325 |
| 7 | 108 | 114 | 30 | 463 | 487½ |
| 8 | 123½ | 130 | 40 | 617 | 650 |
| 9 | 139 | 146 | 50 | 771½ | 813 |
| 10 | 154 | 162½ | 60 | 926 | 975½ |
| 11 | 170 | 179 | 70 | 1,080 | 1,138 |
| 12 | 185 | 194 | 80 | 1,234½ | 1,300½ |
| 13 | 201 | 211 | 90 | 1,389 | 1,463 |
| 14 | 216 | 227½ | 100 | 1,543 | 1,625½ |
| .. | .... | .. . | 1,000 | 15,432½ | 16,256½ |
| .. | .... | ... | .... | 1 kilo. | liter. |

The "kilo" or kilogram, the 1,000 gram weight, is equal to 32 ounces $72\frac{3}{10}$ grains "Troy or Apothecaries" weight, or 2 pounds 3 ounces $119\frac{7}{10}$ grains Avoirdupois.

The "liter" or 1,000 cubic centimeters, or bulk of water that weighs 1 kilo, is equal to 2 pints 1 fluid ounce and $415\frac{3}{10}$ minims, U. S. P. Standard, or our glass graduates as commonly sold by reliable houses.

The grains and minims are easily reduced to fluid drachms and fluid ounces, or drachms and ounces Troy, by my readers, if they will only remember that 60 grains or minims go to the solid or fluid drachm, and 480 grains or minims, or 8 drachms solid or fluid, go to each U. S. P. ounce, solid or fluid.

Thus the table gives the value of 90 grams as 1,389 grains, of 90 cubic centimeters as 1,463 minims. How many ounces in each?

Dividing 1,389 by 60 for drachms, we have 23 drachms 9 grains. As 8 drachms go to the ounce, there are 2 ounces in the 23 drachms and 7 drachms over, so we have—in 1,389 grains there are 2 ounces 7 drachms 9 grains. In the same way we find 3 fluid ounces and 23 minims over, to be the value of 90 cubic centimeters or 1,463 minims.

# TABLE SHOWING THE COMPARISON OF THE READINGS OF THERMOMETERS.

CELSIUS, OR CENTIGRADE (C). RÉAUMUR (R). FAHRENHEIT (F).

| C. | R. | F. | C. | R. | F. |
|---|---|---|---|---|---|
| —30 | —24.0 | —22.0 | 23 | 18.4 | 73.4 |
| —25 | —20.0 | —13.0 | 24 | 19.2 | 75.2 |
| —20 | —16.0 | — 4.0 | 25 | 20.0 | 77.0 |
| —15 | —12.0 | + 5 0 | 26 | 20.8 | 78.8 |
| —10 | — 8.0 | 14.0 | 27 | 21.6 | 80.6 |
| — 5 | — 4.0 | 23.0 | 28 | 22.4 | 82 4 |
| — 4 | — 3.2 | 24.8 | 29 | 23 2 | 84.2 |
| — 3 | — 2.4 | 26.6 | 30 | 24.0 | 86.0 |
| — 2 | — 1.6 | 28.4 | 31 | 24.8 | 87.8 |
| — 1 | — 0.8 | 30.2 | 32 | 25.6 | 89.6 |
| | | | 33 | 26.4 | 91.4 |
| Freezing point of water. | | | 34 | 27.2 | 93.2 |
| | | | 35 | 28.0 | 95.0 |
| 0 | 0.0 | 32.0 | 36 | 28.8 | 96.8 |
| 1 | 0.8 | 33.8 | 37 | 29.6 | 98.6 |
| 2 | 1.6 | 35.6 | 38 | 30.4 | 100.4 |
| 3 | 2.4 | 37.4 | 39 | 31.2 | 102.2 |
| 4 | 3.2 | 39.2 | 40 | 32.0 | 104.0 |
| 5 | 4.0 | 41.0 | 41 | 32.8 | 105.8 |
| 6 | 4.8 | 42.8 | 42 | 33.6 | 107.6 |
| 7 | 5.6 | 44.6 | 43 | 34.4 | 109.4 |
| 8 | 6.4 | 46.4 | 44 | 35.2 | 111.2 |
| 9 | 7.2 | 48.2 | 45 | 36.0 | 113.0 |
| 10 | 8.0 | 50.0 | 50 | 40.0 | 122.0 |
| 11 | 8.8 | 51.8 | 55 | 44.0 | 131.0 |
| 12 | 9.6 | 53.6 | 60 | 48.0 | 140.0 |
| 13 | 10.4 | 55.4 | 65 | 52.0 | 149.0 |
| 14 | 11.2 | 57.2 | 70 | 56.0 | 158.0 |
| 15 | 12.0 | 59.0 | 75 | 60.0 | 167.0 |
| 16 | 12.8 | 60 8 | 80 | 64.0 | 176.0 |
| 17 | 13.6 | 62.6 | 85 | 68.0 | 185.0 |
| 18 | 14.4 | 64.4 | 90 | 72.0 | 194.0 |
| 19 | 15.2 | 66.2 | 95 | 76.0 | 203.0 |
| 20 | 16.0 | 68.0 | 100 | 80.0 | 212.0 |
| 21 | 16.8 | 69.8 | | | |
| 22 | 17.6 | 71.6 | Boiling point of water. | | |

Readings on one scale can be changed into another by the following formulæ, in which $t°$ indicates degrees of temperature:

Réau. to Fahr.

$$\frac{9}{4}t° \text{ R} + 32° = t° \text{ F}$$

Cent. to Fahr.

$$\frac{9}{5}t° \text{ C} + 32° = t° \text{ F}$$

Fahr. to Cent.

$$\frac{5}{9}\left(t° \text{ F} - 32°\right) = t° \text{ C}$$

Réau. to Cent.

$$\frac{5}{4}t° \text{ R} = t° \text{ C}$$

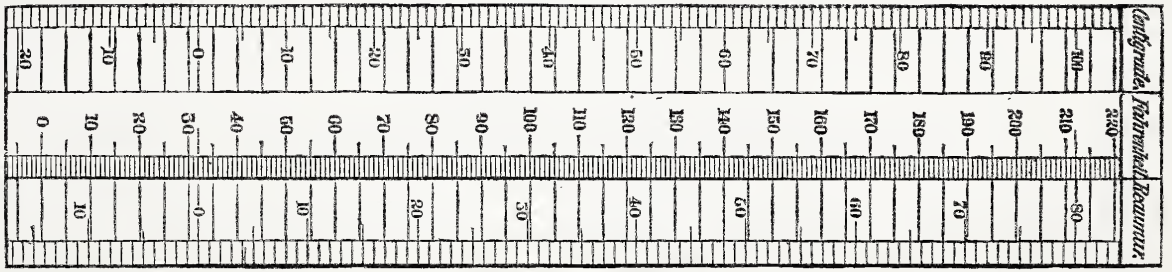
Cent. to Réau.

$$\frac{4}{5}t° \text{ C} = t° \text{ R}$$

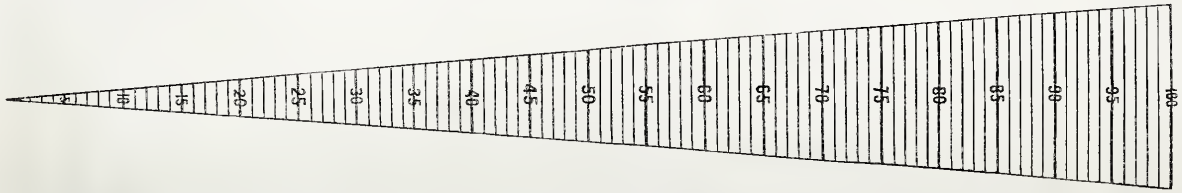
Fahr. to Réau.

$$\frac{4}{9}\left(t° \text{ F} - 32\right) = t° \text{ R}$$

## THERMOMETER SCALES.




## SCALE FOR MEASURING DIAMETERS OF STOPS FOR LENSES.



Each cross line varies in length from the adjacent one by $\frac{1}{100}$th of an inch.

To use: Lay the stop flat on this scale, and select the cross line which is of the same length as the greatest diameter of the opening; read this off, by means of the figures, which will be the measurements in $\frac{1}{100}$ths of an inch. The equivalent focal length of lens, divided by this measurement of the stop opening, will give the fraction expressing the ratio of aperture to focal length. The rapidity of different lenses, or of the same lens with different stops, is proportional to the squares of these ratios.

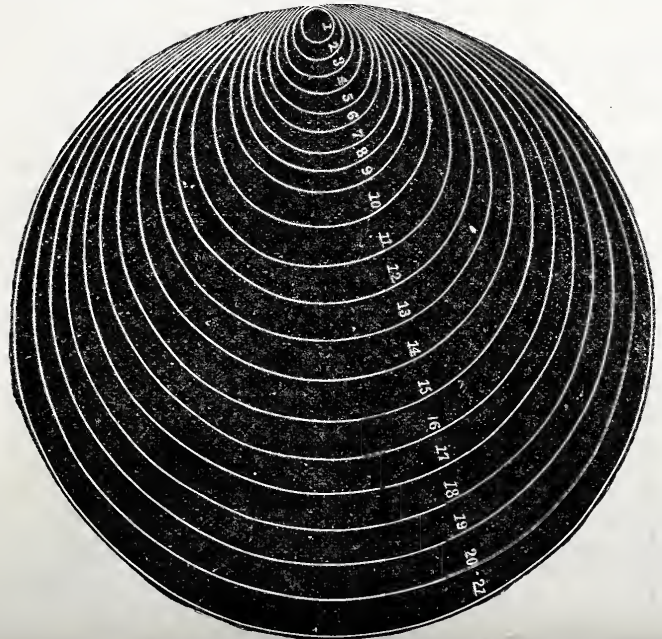
## "UNIFORM SYSTEM" NUMBERS FOR STOPS FROM $\frac{f}{1}$ TO $\frac{f}{100}$.

In the following table Mr. S. A. Warburton has calculated the exposure necessary with every stop from $\frac{f}{1}$ to $\frac{f}{100}$ compared with the unit stop of the "uniform system" of the Photographic Society of Great Britain. The figures which are underlined show in the first column what $\frac{f}{a}$ must be in order to increase the exposure in geometrical ratio from $\frac{f}{4}$, the intermediate numbers showing the uniform system number for any other aperture.

| $f$ | U. S. No. | $f$ | U. S. No. | $f$ | U. S. No. |
|---|---|---|---|---|---|
| 1 | $\frac{1}{16}$ | 15 | 14.06 | 58 | 210.25 |
| 1¼ | .097 | 16 | 16 | 59 | 217.56 |
| 1.414 | ⅛ | 17 | 18.06 | 60 | 225.00 |
| 1½ | .140 | 18 | 20.25 | 61 | 232.56 |
| 1¾ | .191 | 19 | 22.56 | 62 | 240.25 |
| 2 | ¼ | 20 | 25.00 | 63 | 248.06 |
| 2¼ | .316 | 21 | 27.56 | 64 | 256 |
| 2½ | .390 | 22 | 30.25 | 65 | 264.06 |
| 2.828 | ⅓ | 22.62 | 32 | 66 | 272.25 |
| 2¾ | .472 | 23 | 33.06 | 67 | 280.56 |
| 3 | .562 | 24 | 36.00 | 68 | 289.00 |
| 3¼ | .660 | 25 | 39.06 | 69 | 297.56 |
| 3½ | .765 | 26 | 42.25 | 70 | 306 25 |
| 3¾ | .878 | 27 | 45.56 | 71 | 315.06 |
| 4 | 1.00 | 28 | 49.00 | 72 | 324.00 |
| 4¼ | 1.12 | 29 | 52.56 | 73 | 333.06 |
| 4½ | 1.26 | 30 | 56.25 | 74 | 342.25 |
| 4¾ | 1.41 | 31 | 60.06 | 75 | 351.56 |
| 5 | 1.56 | 32 | 64 | 76 | 361.00 |
| 5¼ | 1.72 | 33 | 68.06 | 77 | 370.56 |
| 5½ | 1.89 | 34 | 72.25 | 78 | 380.25 |
| 5.656 | 2 | 35 | 76.56 | 79 | 390.06 |
| 5¾ | 2.06 | 36 | 81.00 | 80 | 400.00 |
| 6 | 2.25 | 37 | 85.56 | 81 | 410.06 |
| 6¼ | 2.44 | 38 | 90.25 | 82 | 420.25 |
| 6½ | 2.64 | 39 | 95.06 | 83 | 430.56 |
| 6¾ | 2.84 | 40 | 100.00 | 84 | 440.00 |
| 7 | 3.06 | 41 | 105.06 | 85 | 451.56 |
| 7¼ | 3.28 | 42 | 110.25 | 86 | 462.25 |
| 7½ | 3.51 | 43 | 115.56 | 87 | 473.06 |
| 7¾ | 3.75 | 44 | 121.00 | 88 | 484.00 |
| 8 | 4 | 45 | 126.56 | 89 | 495.06 |
| 8¼ | 4.25 | 45.25 | 128 | 90 | 506.25 |
| 8½ | 4.51 | 46 | 132.25 | 90.50 | 512 |
| 8¾ | 4.78 | 47 | 138.06 | 91 | 517.56 |
| 9 | 5.06 | 48 | 144.00 | 92 | 529.00 |
| 9¼ | 5.34 | 49 | 150.06 | 93 | 540.56 |
| 9½ | 5.64 | 50 | 156.25 | 94 | 552.25 |
| 9¾ | 5.94 | 51 | 162.56 | 95 | 564.06 |
| 10 | 6.25 | 52 | 169.00 | 96 | 576.00 |
| 11 | 7.56 | 53 | 175.56 | 97 | 588.06 |
| 11.31 | 8 | 54 | 182.25 | 98 | 600.25 |
| 12 | 9.00 | 55 | 189.06 | 99 | 612.56 |
| 13 | 10.56 | 56 | 196.00 | 100 | 625.00 |
| 14 | 12.25 | 57 | 203.06 | | |

# THE PHOTOGRAPHIC SOCIETY'S (OF GREAT BRITAIN) STANDARD DIAPHRAGMS.

THE annexed diagram and table are intended to facilitate the calculation of the proper number with which to mark the diaphragms according to the Photographic Society of Great Britain's Uniform System, which will be found described on another page. This number it is proposed to call the "U. S." (or uniform system number). The numbered circles in the diagram represent the sizes of stops. The photographer, knowing the equivalent focus of his lens, looks along the line opposite the number which represents the circle nearest inside to his diaphragm, and when he gets to the column headed by that equivalent focus the number there found is the U. S. number to be marked on the diaphragm. For example: A lens of eight inches equivalent focus has a diaphragm in size about No. 5 on the diaphragm; running the eye along the line opposite No. 5 we find in the column under—"focus eight inches" the No. 11, which is the U. S. number required.




| No. of Circle. | 4 focus | 5 focus | 6 focus | 7 focus | 8 focus | 9 focus | 10 focus | 12 focus | 14 focus |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 25 | 39 | 56 | | | | | | |
| 2 | 11 | 17 | 25 | 34 | 44 | 56 | 68 | | |
| 3 | 6½ | 10 | 14 | 19 | 25 | 31 | 40 | 56 | |
| 4 | 4 | 6¼ | 9 | 12 | 16 | 20 | 25 | 36 | 48 |
| 5 | 2¾ | 4⅓ | 6¼ | 8⅛ | 11 | 14 | 17 | 25 | 34 |
| 6 | 2 | 3⅕ | 4½ | 6¼ | 8 | 10 | 13 | 18 | 25 |
| 7 | 1½ | 2⅓ | 3⅓ | 4⅝ | 6 | 8 | 10 | 14 | 19 |
| 8 | 1¼ | 2 | 2⅝ | 3¾ | 5 | 6⅓ | 8 | 11 | 15 |
| 9 | 1 | 1⅓ | 2⅓ | 3 | 4 | 5 | 6⅓ | 9 | 12¼ |
| 10 | | 1 | 1⅓ | 2⅛ | 2⅝ | 3½ | 4⅓ | 6 | 8⅓ |
| 11 | | | 1¼ | 1⅓ | 2 | 2⅔ | 3⅕ | 5 | 6 |
| 12 | | | ⅞ | 1⅛ | 1⅓ | 2 | 2⅔ | 3⅓ | 4¾ |
| 13 | | | | 1 | 1¼ | 1⅝ | 1⅞ | 2⅝ | 4 |
| 14 | | | | | 1 | 1¼ | 1⅓ | 2¼ | 3 |
| 15 | | | | | | 1 | 1⅛ | 1⅞ | 2⅛ |
| 16 | | | | | | | 1 | 1⅓ | 2 |
| 17 | | | | | | | | 1⅛ | 1⅞ |
| 18 | | | | | | | | 1⅛ | 1⅓ |
| 19 | | | | | | | | 1 | 1⅛ |
| 20 | | | | | | | | | 1⅛ |
| 21 | | | | | | | | | 1 |

NOTE.—This table, taken from the "British Journal Photographic Almanac," has proved to be very convenient in the calculating of stop values.

# EQUATIONS RELATING TO FOCI.

The following simple optical formulas and calculations, worked out by Mr. J. A. C. Branfill, for the *British Journal Almanac*, will prove useful in many branches of photography, especially where several lenses of varying foci are in constant use for a variety of purposes:

$p$ = Principal focus.
$F$ = Greater conjugate focus.
$f$ = Lesser conjugate focus.
$r$ = Ratio of any dimension in original to the same dimensions in copy (in case of reduction), or *vice versa* (in case of enlargement).
$a$ = Diameter of aperture to lens.
$x$ = Exposure required, assuming that $x = 1$ when $a = \frac{p}{4}$.

$$p = \frac{r(F+f)}{(r+1)^2}$$

$$f = p\left(\frac{1+r}{r}\right) = \frac{F+f}{r+1}$$

$$F = p(r+1) = rf$$

$$F+f = p \times \frac{(r+1)^2}{r} = p\left(2 + r + \frac{1}{r}\right)$$

$$r = \frac{F-p}{p} = \frac{p}{f-p} = \frac{F}{f}$$

$$x = \frac{f^2}{16\,a^2}$$

N. B.—For ordinary landscape work, where $r$ is greater than 20, $x$ may be taken as $\frac{p^2}{16\,a^2}$

Note.—In case the above may not be clear to some photographers, the following rules may be better understood:

To find the principal focus of a lens ($p$), focus a near object in the camera, and measure the distance between it and the ground glass ($F+f$); next find the proportion which any dimension in the object bears to the same dimension on the ground glass ($r$). Thus, if the original dimension be four times as large as its reproduction, we say that $r$ equals (=) 4. Multiply $F+f$ by $r$, and divide the product by the square of a number greater by one than $r$, that is by $(r+1)^2$. This rule was lately published by Mr. Dehenham.

To find the lesser conjugate focus ($f$) (if $p$ and $r$ are known), multiply $p$ by the sum of $r+1$ and divide the product by $r$. Or divide $F+f$ by $r+1$.

To find the greater conjugate focus ($F$) multiply $p$ by $r+1$. Or multiply $f$ by $r$.

To find $F+f$ (the distance which the ground glass should be from the object to be copied in order to get a given value for $r$) multiply $p$ by the sum of $r + \frac{1}{r} + 2$.

To find $r$ divide $F-p$ (the difference between $F$ and $p$) by $p$. Or divide $p$ by $f-p$. Or divide $F$ by $f$.

To find $x$ divide the square of $f$ by 16 times the square of $a$ (the diameter of aperture to lens).

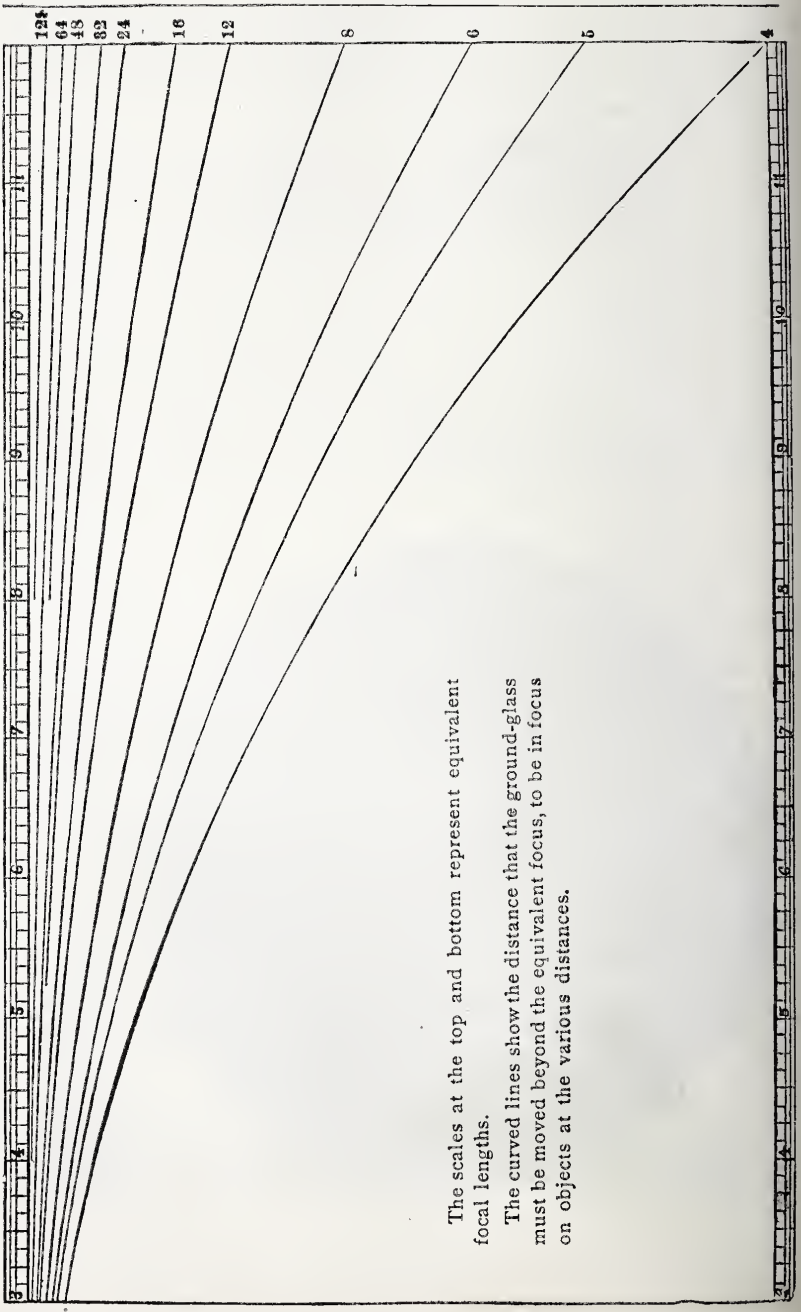
For example Focus an object which is five inches high, so that it is one inch high on the ground glass; thus we know that $r = 5$. Next measure the distance between the object and the ground glass ($F+f$), which is found to be 45 inches.

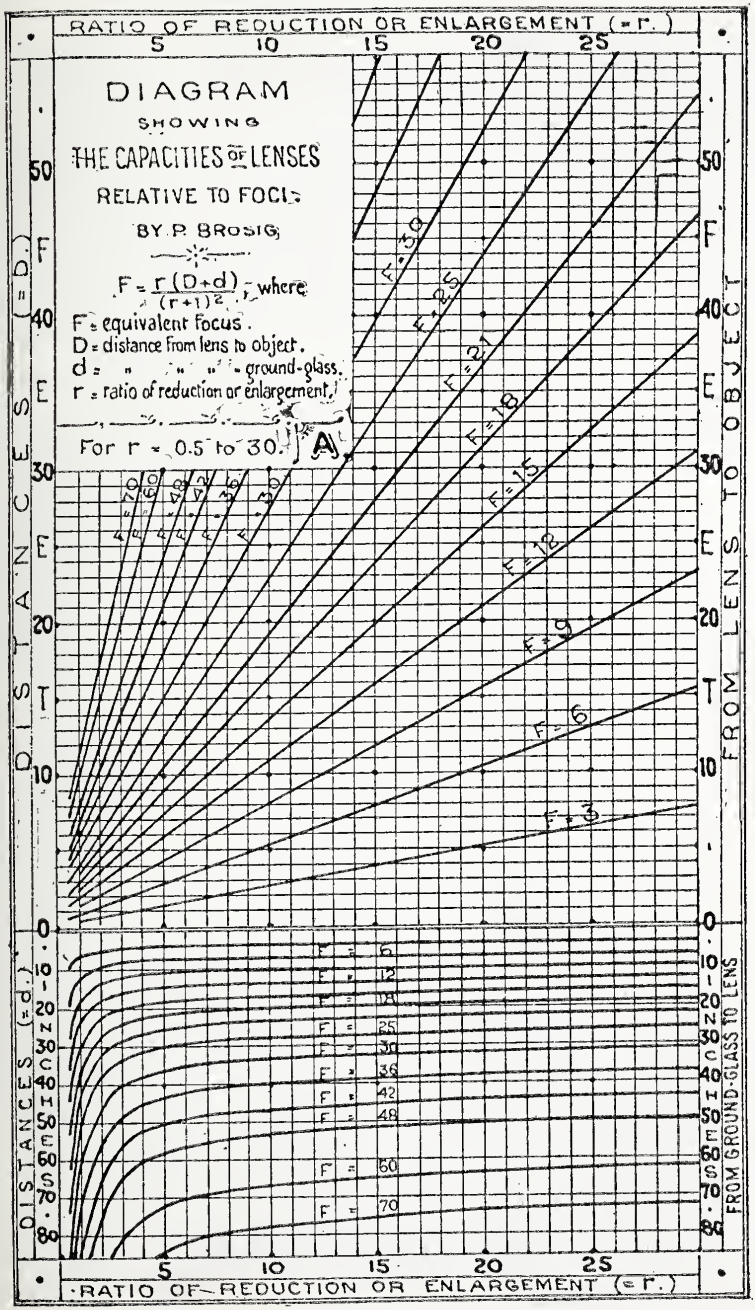
Then $p = 45 \times$ (multiplied by) $5 \div$ (divided by) $6 \times 6 = 6\frac{1}{4}$ inches.
$f = 6\frac{1}{4} \times 6 \div 5 = 7\frac{1}{2}$ inches. Or $f = 45 \div 6 = 7\frac{1}{2}$ inches.
$F = 6\frac{1}{4} \times 6 = 37\frac{1}{2}$ inches. Or $F = 7\frac{1}{2} \times 5 = 37\frac{1}{2}$ inches.
$F+f = 6\frac{1}{4} \times (5 + \frac{1}{5} + 2) = 6\frac{1}{4} \times 7\frac{1}{5} = 45$ inches.
$r = (37\frac{1}{2} - 6\frac{1}{4}) \div 6\frac{1}{4} = 5$. Or $r = 6\frac{1}{4} \div (7\frac{1}{2} - 6\frac{1}{4}) = 5$.

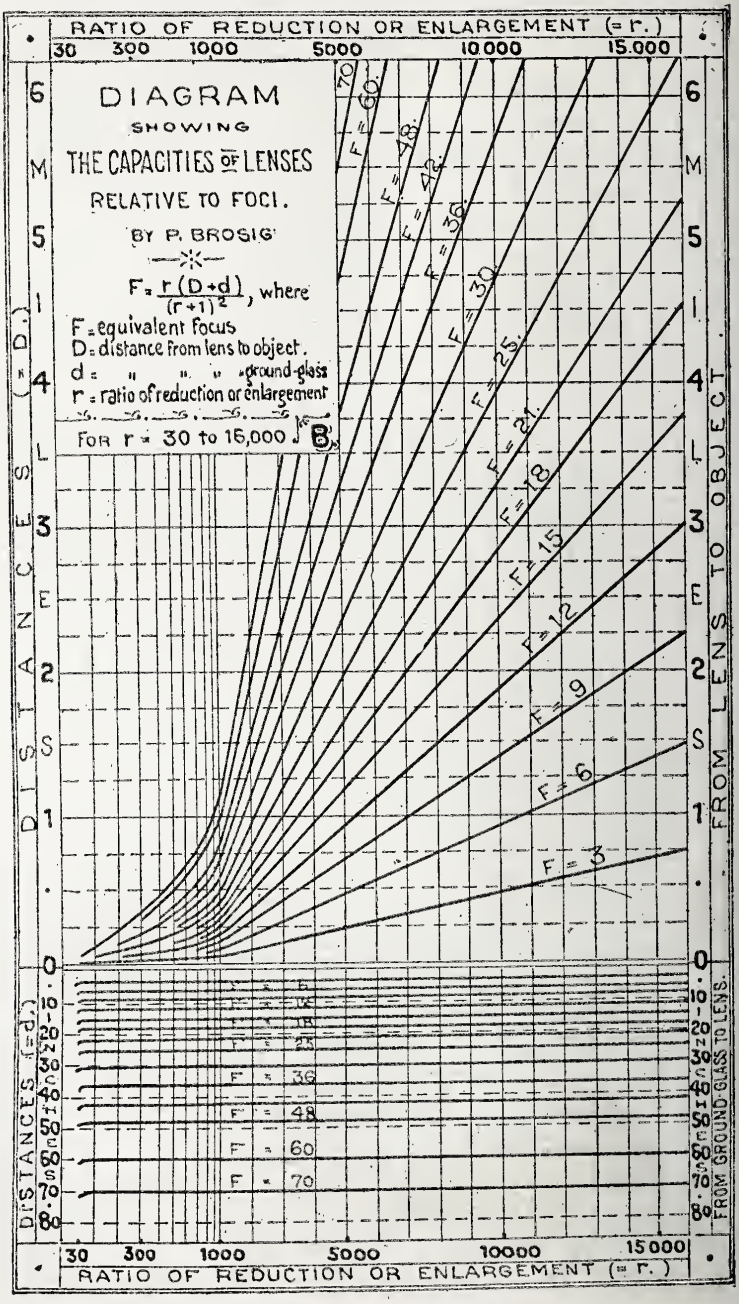
And $x$ (the exposure required) will be $7\frac{1}{2} \times 7\frac{1}{2} \div (16 \times \frac{9}{16}) = 6\frac{1}{4}$; that is, the exposure will be $6\frac{1}{4}$ times as much as the exposure required with an aperture whose diameter equals $p \div 4$, assuming the aperture ($a$) to be $\frac{1}{4}$ inch diameter.

# FOCUSING SCALES FOR ANY LENS OF FROM 3 TO 12 INCHES EQUIVALENT FOCUS.

Drawn by W. T. WINTRINGHAM.




RATIO OF REDUCTION OR ENLARGEMENT (= r.)
5
10
15
20
25
DIAGRAM
SHOWING
THE CAPACITIES OF LENSES
RELATIVE TO FOCI
BY P. BROCIG
$F = \frac{r(D+d)}{(r+1)^2}$, where
F = equivalent focus.
D = distance from lens to object.
d = " " " ground-glass.
r = ratio of reduction or enlargement.
For r = 0.5 to 30.
A
F = 30
F = 25
F = 21
F = 18
F = 15
F = 12
F = 9
F = 6
F = 3
DISTANCES (= D.) FROM LENS TO OBJECT
DISTANCES (= d.) FROM GROUND-GLASS TO LENS
F = 6
F = 12
F = 18
F = 25
F = 30
F = 36
F = 42
F = 48
F = 60
F = 70
INCHES
RATIO OF REDUCTION OR ENLARGEMENT (= r.)

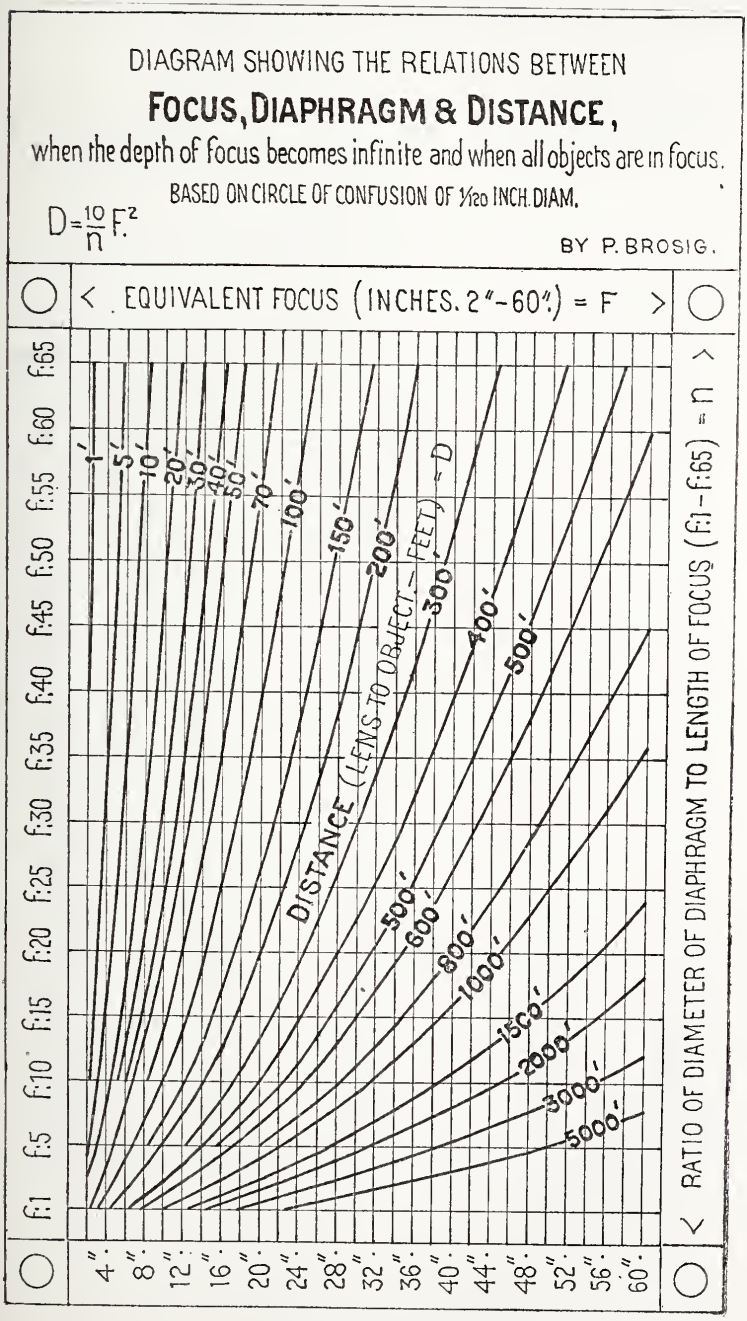

RATIO OF REDUCTION OR ENLARGEMENT (= r.)
30 300 1000 5000 10 000 15.000
DIAGRAM
SHOWING
THE CAPACITIES OF LENSES
RELATIVE TO FOCI.
BY P. BROSIG
$F = \frac{r(D+d)}{(r+1)^2}$, where
F = equivalent Focus
D = distance from lens to object.
d = " " " ground-glass
r = ratio of reduction or enlargement
FOR r = 30 to 15,000
F = 60.
F = 48.
F = 42.
F = 36.
F = 30.
F = 25.
F = 21.
F = 18.
F = 15.
F = 12.
F = 9.
F = 6.
F = 3.
DISTANCES (= D.) FROM LENS TO OBJECT.
DISTANCES (= d.) FROM GROUND GLASS TO LENS.
F = 36
F = 48
F = 60
F = 70
30 300 1000 5000 10000 15000
RATIO OF REDUCTION OR ENLARGEMENT (= r.)



Electro Tint Engraving Co , Phila.

PORTRAIT STUDY.

By AIMÉ DUPONT.


DIAGRAM SHOWING THE RELATIONS BETWEEN
FOCUS, DIAPHRAGM & DISTANCE,
when the depth of focus becomes infinite and when all objects are in focus.
BASED ON CIRCLE OF CONFUSION OF 1/120 INCH DIAM.
D = 10/n F²
BY P. BROSIG.
EQUIVALENT FOCUS (INCHES. 2"-60".) = F
RATIO OF DIAMETER OF DIAPHRAGM TO LENGTH OF FOCUS (f:1-f:65) = n
f:1 f:5 f:10 f:15 f:20 f:25 f:30 f:35 f:40 f:45 f:50 f:55 f:60 f:65
4" 8" 12" 16" 20" 24" 28" 32" 36" 40" 44" 48" 52" 56" 60"
DISTANCE (LENS-TO OBJECT - FEET) = D
1' 5' 10' 20' 30' 40' 50' 70' 100' 150' 200' 300' 400' 500' 500' 600' 800' 1000' 1500' 2000' 3000' 5000'

# TABLE SHOWING DISPLACEMENT ON GROUND GLASS OF OBJECTS IN MOTION.

By HENRY L. TOLMAN.

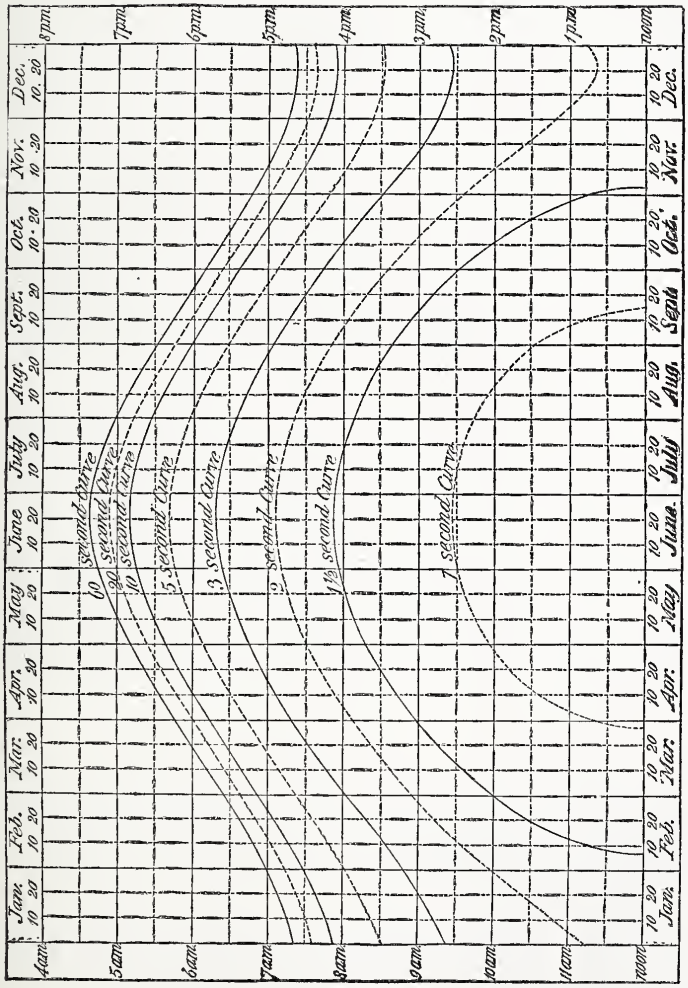
[Republished, with corrections, from the *Photographic Times.*]

Lens 6 in Equiv. Focus, Ground Glass at Principal Focus of Lens.

| Miles per Hour. | Feet per Second. | Distance on Ground Glass, in inches, with Object 30 Feet away. | Same with Object 60 Feet away. | Same with Object 120 Feet away. |
|---|---|---|---|---|
| 1 | 1½ | .29 | .15 | .073 |
| 2 | 3 | .59 | .29 | .147 |
| 3 | 4½ | .88 | .44 | .220 |
| 4 | 6 | 1.17 | .59 | .293 |
| 5 | 7½ | 1.47 | .73 | .367 |
| 6 | 9 | 1.76 | .88 | .440 |
| 7 | 10½ | 2.05 | 1 03 | .513 |
| 8 | 12 | 2 35 | 1.17 | .587 |
| 9 | 13 | 2.64 | 1.32 | .660 |
| 10 | 14½ | 2.93 | 1.47 | .733 |
| 11 | 16 | 3.23 | 1.61 | .807 |
| 12 | 17½ | 3.52 | 1.76 | .880 |
| 13 | 19 | 3.81 | 1.91 | .953 |
| 14 | 20½ | 4.11 | 2.05 | 1.027 |
| 15 | 22 | 4.40 | 2.20 | 1.100 |
| 20 | 29 | 5.87 | 2.93 | 1.467 |
| 25 | 37 | 7.33 | 3 67 | 1.833 |
| 30 | 44 | 8.80 | 4.40 | 2.200 |
| 35 | 51 | 10.27 | 5.13 | 2.567 |
| 40 | 59 | 11.73 | 5.97 | 2·933 |
| 45 | 66 | 13 20 | 6.60 | 3.300 |
| 50 | 73 | 14.67 | 7.33 | 3.667 |
| 55 | 80 | 16.13 | 8.06 | 4.033 |
| 60 | 88 | 17.60 | 8.80 | 4.400 |
| 75 | 110 | 22.00 | 11.00 | 5.500 |
| 100 | 147 | 29.33 | 14.67 | 7.333 |
| 125 | 183 | 36.67 | 18.33 | 9.167 |
| 150 | 220 | 44.00 | 22.00 | 11.000 |

# DIAGRAM OF COMPARATIVE EXPOSURES.

Computed for the latitude of Washington, D. C. (38 deg., 54 min., N.)
By Lieut. Commander S. W. Very, U. S. N.



The straight lines in this diagram represent divisions of time; the vertical ones showing the month and day, and the horizontal ones the time of day as shown by a sun-dial.

The curved lines are curves of equal altitudes of the sun, computed for the latitude of Washington, for the year 1889.

The combination of the two systems of lines is designed to enable the photographer, whether amateur or professional, who has at some time determined the length of exposure required under certain circumstances of subject, clouds, lens, diaphragm, plate or film, etc., to decide what exposure to give *under the same circumstances*, at any time between sunrise and sunset, on any day of the year.

The diagram is based upon one constructed for the latitude of London, published in the *Photographic News*, in 1887, and reprinted in the ANNUAL of 1888, and the same standard of comparison is used in this adaptation—that is, such circumstances of subject, clouds, lens, diaphragm, plate or film, etc., as will require an exposure of one second, at noon of any day between the 4th of April and the 7th of September, or at any time between a quarter to ten in the forenoon and a quarter past two in the afternoon on the 21st of June.

The diagram, although constructed for the year 1889, and for the latitude of Washington, will serve equally well for any other year, and well enough for ordinary purposes, throughout the United States (exclusive of Alaska), although in the extreme Northern and Southern belts it will not be accurate.

The diagram is strictly accurate for "apparent time" only, but it is sufficiently so for "local mean time" (which may differ sixteen minutes from "apparent time"), and in the great majority of places for "standard time" (which in some places differs half an hour from "mean time," and may differ three-quarters of an hour from "apparent time").

## EXAMPLES.

Q. With a certain lens, diaphragm, etc., it is found that on the 20th of July, at 9.30 A.M., a certain subject requires three seconds' exposure; what time should be given on the 10th of December, at 3.30 P.M., the subject, lens, etc., being the same?

A. Fifteen seconds.

Q. At noon of the 15th of May, a certain subject required ten seconds; what length of exposure should be given to the same subject, with the same lens, diaphragm, etc., on the 1st of November, at 8 A.M.?

A. Forty-five seconds.

# TABLE OF COMPARATIVE LIGHT VALUES.

By Rev. Dwight W. Smith.

While there is a wider range in timing the exposure of a dry plate than is generally supposed, yet it is well known that there is but one correct interval for the best results with a normal developer. To best approximate that interval at all available hours of the day and year requires some attention and experience. There was a time when plates of a given brand and sensitiveness were quite unreliable, but now that they are so uniform, and improving more and more in this direction, tables of light values that were found to be comparatively useless will now be found of increasing value. The subjoined table, based upon the diagram in this book, by Lieutenant S. W. Very, U. S. N., has been computed for the first half of each month, and at a glance one may obtain information that would otherwise require time and trouble, and that even skill and experience does not always provide for, especially during the time indicated in which there is a rapid loss of light. It will be seen that in January, the light value for noon is given as 1.7, while at 4 P.M. the exposure would necessarily be more than five times that duration. For July, the most rapid as well as longest available light of any month, the light at noon is indicated by .2 instead of 1.7, and at 3 P.M. more than twice the time will be required.

The first column indicates the hour of the day; the second column the comparative light values in whole numbers and tenths.

| JANUARY. | | FEBRUARY. | | MARCH. | | APRIL. | |
|---|---|---|---|---|---|---|---|
| 8 | 10 | 8 | 6 | 8 | 3 | 8 | 2 |
| 9 | 4 | 9 | 4 | 9 | 2 | 9 | 1.5 |
| 10 | 2.5 | 10 | 2 | 10 | 1.5 | 10 | 1.7 |
| 11 | 2 | 11 | 1.7 | 11 | 1.2 | 11 | 1 |
| 12 | 1.7 | 12 | 1.5 | 12 | 1 | 12 | 1 |
| 1 | 1.7 | 1 | 2 | 1 | 1 | 1 | 1 |
| 2 | 2.5 | 2 | 2.7 | 2 | 1.7 | 2 | 1.2 |
| 3 | 4.5 | 3 | 3.5 | 3 | 2 | 3 | 1.5 |
| 4 | 9 | 4 | 5 | 4 | 4 | 4 | 2 |
| | | 5 | 60 | 5 | 20 | 5 | 4 |
| | | | | | | 6 | 20 |

| MAY. | | JUNE. | | JULY. | | AUGUST. | |
|---|---|---|---|---|---|---|---|
| 8 | 1.7 | 8 | 1.7 | 8 | 1.5 | 8 | 1.7 |
| 9 | 1.2 | 9 | 1.2 | 9 | 1.2 | 9 | 1.5 |
| 10 | 1 | 10 | 1 | 10 | 1 | 10 | 1 |
| 11 | .7 | 11 | .6 | 11 | .5 | 11 | .7 |
| 12 | .5 | 12 | .3 | 12 | .2 | 12 | .5 |
| 1 | .7 | 1 | .5 | 1 | .5 | 1 | .5 |
| 2 | 1 | 2 | .7 | 2 | 1 | 2 | 1 |
| 3 | 1.2 | 3 | 1.2 | 3 | 1.2 | 3 | 1.2 |
| 4 | 1.5 | 4 | 1.5 | 4 | 1.5 | 4 | 1.7 |
| 5 | 2.7 | 5 | 2.2 | 5 | 2.2 | 5 | 2.5 |
| 6 | 15 | 6 | 5 | 6 | 4 | 6 | 5 |
| 7 | 80 | 7 | 20 | 7 | 15 | 7 | 60 |

| SEPTEMBER. | | OCTOBER. | | NOVEMBER. | | DECEMBER. | |
|---|---|---|---|---|---|---|---|
| 8 | 2 | 8 | 3 | 8 | 4 | 8 | 9 |
| 9 | 1.5 | 9 | 1.7 | 9 | 3 | 9 | 3 |
| 10 | 1 | 10 | 1.5 | 10 | 2 | 10 | 2 |
| 11 | 1 | 11 | 1.2 | 11 | 1 7 | 11 | 1.5 |
| 12 | .5 | 12 | 1 | 12 | 1.5 | 12 | 1.7 |
| 1 | 1 | 1 | 1.2 | 1 | 1.5 | 1 | 2 |
| 2 | 1.2 | 2 | 1.5 | 2 | 2 | 2 | 2.5 |
| 3 | 1.5 | 3 | 2 | 3 | 2.5 | 3 | 3.5 |
| 4 | 2 | 4 | 2.7 | 4 | 5 | 4 | 8 |
| 5 | 3 | 5 | 6 | 5 | 20 | 5 | 80 |
| 6 | 10 | 6 | 40 | 6 | 70 | | |

## PROF. BURTON'S TABLE OF COMPARATIVE EXPOSURES.

| Apertures Calculated on the Standard System of the Photographic Society. | Sea and Sky. | Open Landscape. | Landscape with heavy foliage in foreground. | Under Trees, up to | Fairly Lighted Interiors. | Badly Lighted Interiors, up to | Portraits in bright diffused Light out of doors. | Portraits in good Studio Light. | Portraits in Ordinary Room. |
|---|---|---|---|---|---|---|---|---|---|
| | | | | mins. secs. | mins. secs. | hrs. mins. | | mins. secs. | mins. secs. |
| No. 1, or $\frac{f}{4}$ | $\frac{1}{100}$ sec. | $\frac{1}{50}$ sec. | $\frac{1}{8}$ sec. | 0 10 | 0 10 | 0 2 | $\frac{1}{6}$ sec. | 0 1 | 0 4 |
| No. 2, or $\frac{f}{5.657}$ | $\frac{1}{200}$ sec. | $\frac{1}{25}$ sec. | $\frac{1}{4}$ sec. | 0 20 | 0 20 | 0 4 | $\frac{1}{3}$ sec. | 0 2 | 0 8 |
| No. 4, or $\frac{f}{8}$ | $\frac{1}{400}$ sec. | $\frac{1}{12}$ sec. | $\frac{1}{2}$ sec. | 0 40 | 0 40 | 0 8 | $\frac{2}{3}$ sec. | 0 4 | 0 16 |
| No. 8, or $\frac{f}{11.314}$ | $\frac{1}{200}$ sec. | $\frac{1}{6}$ sec. | 1 sec. | 1 20 | 1 20 | 0 16 | $1\frac{1}{3}$ sec. | 0 8 | 0 32 |
| No. 16, or $\frac{f}{16}$ | $\frac{1}{100}$ sec. | $\frac{1}{3}$ sec. | 2 secs. | 2 40 | 2 40 | 0 32 | $2\frac{2}{3}$ secs. | 0 16 | 1 4 |
| No. 32, or $\frac{f}{22.627}$ | $\frac{1}{50}$ sec. | $\frac{2}{3}$ sec. | 4 secs. | 5 20 | 5 20 | 1 4 | $5\frac{1}{3}$ secs. | 0 32 | 2 8 |
| No. 64, or $\frac{f}{32}$ | $\frac{2}{50}$ sec. | $1\frac{1}{3}$ sec. | 8 secs. | 10 40 | 10 40 | 2 8 | $10\frac{2}{3}$ secs. | 1 4 | 4 16 |
| No. 128, or $\frac{f}{45.255}$ | $\frac{4}{50}$ sec. | $2\frac{2}{3}$ secs. | 16 secs. | 21 20 | 21 20 | 4 16 | 21 secs. | 2 8 | 8 32 |
| No. 256, or $\frac{f}{64}$ | $1\frac{3}{50}$ sec. | $5\frac{1}{3}$ secs. | 32 secs. | 42 40 | 42 40 | 8 32 | 42 secs. | 4 16 | 17 4 |

# LANTERNISTS' READY REFERENCE TABLE.

(From Optical Magic Lantern Journal.)

If A=focal length of objective, B=diameter of slide, C=diameter of disc on screen, D=distance between objective and screen, then $D=\frac{C \times A}{B}$ $A=\frac{D \times B}{C}$ $C=\frac{D \times B}{A}$

The following table has been computed by these rules and will show by a glance the relations between the size of disc and distance from screen for object glasses of all foci from 4 inches to 15 inches. The diameter of slide is taken as 3 inches, that being the usual opening of the mat.

| Distance between Lantern and Screen. | FOCUS OF LENS. | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 4in. | | 5in. | | 6in. | | 7in. | | 8in. | | 9in. | | 10in. | | 11in. | | 12in. | | 13in. | | 14in. | | 15in. | |
| | DIAMETER OF DISC. | | | | | | | | | | | | | | | | | | | | | | | |
| | ft. | in. | ft. | in. | ft. | in. | ft. | in. | ft. | in. | ft. | in. | ft. | in. | ft. | in. | ft. | in. | ft. | in. | ft. | in. | ft. | in. |
| 10 feet. | 7 | 6 | 6 | 0 | 5 | 0 | 4 | 3 | 3 | 9 | 3 | 4 | 3 | 0 | 2 | 9 | 2 | 6 | 2 | 4 | 2 | 2 | 2 | 0 |
| 11 " | 8 | 3 | 6 | 7 | 5 | 6 | 4 | 9 | 4 | 2 | 3 | 8 | 3 | 4 | 3 | 0 | 2 | 9 | 2 | 6 | 2 | 4 | 2 | 2 |
| 12 " | 9 | 0 | 7 | 2 | 6 | 0 | 5 | 2 | 4 | 6 | 4 | 0 | 3 | 7 | 3 | 3 | 3 | 0 | 2 | 9 | 2 | 7 | 2 | 5 |
| 13 " | 9 | 9 | 7 | 10 | 6 | 6 | 5 | 7 | 4 | 11 | 4 | 4 | 3 | 11 | 3 | 7 | 3 | 3 | 3 | 0 | 2 | 9 | 2 | 7 |
| 14 " | 10 | 6 | 8 | 5 | 7 | 0 | 6 | 0 | 5 | 3 | 4 | 8 | 4 | 2 | 3 | 10 | 3 | 7 | 3 | 3 | 3 | 0 | 2 | 9 |
| 15 " | 11 | 3 | 9 | 0 | 7 | 6 | 6 | 5 | 5 | 8 | 5 | 0 | 4 | 6 | 4 | 1 | 3 | 9 | 3 | 6 | 3 | 3 | 3 | 0 |
| 20 " | 15 | 0 | 12 | 0 | 10 | 0 | 8 | 7 | 7 | 6 | 6 | 8 | 6 | 0 | 5 | 6 | 5 | 0 | 4 | 7 | 4 | 3 | 4 | 0 |
| 25 " | 18 | 9 | 15 | 0 | 12 | 6 | 10 | 9 | 9 | 4 | 8 | 4 | 7 | 6 | 6 | 10 | 6 | 3 | 5 | 0 | 5 | 4 | 5 | 0 |
| 30 " | 22 | 6 | 18 | 0 | 15 | 0 | 12 | 10 | 11 | 3 | 10 | 0 | 9 | 0 | 8 | 2 | 7 | 6 | 6 | 11 | 6 | 5 | 6 | 0 |
| 35 " | 26 | 3 | 21 | 0 | 17 | 6 | 15 | 0 | 13 | 1 | 11 | 8 | 10 | 6 | 9 | 6 | 8 | 9 | 8 | 1 | 7 | 6 | 7 | 0 |
| 40 " | 30 | 0 | 24 | 0 | 20 | 0 | 17 | 2 | 15 | 0 | 13 | 4 | 12 | 0 | 10 | 10 | 10 | 0 | 9 | 2 | 8 | 6 | 8 | 0 |
| 45 " | 33 | 9 | 27 | 0 | 22 | 6 | 19 | 3 | 16 | 10 | 15 | 0 | 13 | 6 | 12 | 3 | 11 | 3 | 10 | 4 | 9 | 8 | 9 | 0 |
| 50 " | 37 | 6 | 30 | 0 | 25 | 0 | 21 | 5 | 18 | 9 | 16 | 8 | 15 | 0 | 13 | 8 | 12 | 6 | 11 | 6 | 10 | 9 | 10 | 0 |

EXAMPLES.—An 8in. focus lens at a distance of 35ft. will give a disc of 13ft. 1in. To produce a disc of 12ft. with a lens of 10in. focus, the lantern and screen must be separated by 40ft. To produce a disc of 15ft. at a distance of 45ft. will require a lens of 9in. focus.

# TABLE FOR ENLARGEMENT AND REDUCTION.

COMPUTED FOR CENTIMETERS OR INCHES.

| Equivalent Focus of the Lens. | DISTANCES OF THE OBJECT AND THE GROUND GLASS SCREEN FROM THE CENTER OF THE OBJECTIVE. | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 *t.* | 2 *t.* | 3 *t.* | 4 *t.* | 5 *t.* | 6 *t.* | 7 *t.* | 8 *t.* | 9 *t.* | 10 *t.* | 11 *t.* | 12 *t.* | 13 *t.* | 14 *t.* | 15 *t.* | 16 *t.* | 17 *t.* | 18 *t.* | 19 *t.* | 20 *t.* | 21 *t.* | 22 *t.* | 23 *t.* | 24 *t.* | 25 *t.* |
| 5.. | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 105 | 110 | 115 | 120 | 125 | 130 |
| | 10 | 7.5 | 6.7 | 6.2 | 6 | 5.8 | 5.7 | 5.6 | 5.6 | 5.5 | 5.5 | 5.4 | 5.4 | 5.4 | 5.3 | 5.3 | 5.3 | 5.3 | 5.3 | 5.3 | 5.2 | 5.2 | 5.2 | 5.2 | 5.2 |
| 6.. | 12 | 18 | 24 | 30 | 36 | 42 | 48 | 54 | 60 | 66 | 72 | 78 | 84 | 90 | 96 | 102 | 108 | 114 | 120 | 126 | 132 | 138 | 144 | 150 | 156 |
| | 12 | 9 | 8 | 7.5 | 7.2 | 7 | 6.9 | 6.8 | 6.7 | 6.6 | 6.5 | 6.5 | 6.5 | 6.4 | 6.4 | 6.4 | 6.4 | 6.3 | 6.3 | 6.3 | 6.3 | 6.3 | 6.3 | 6.3 | 6.2 |
| 7.. | 14 | 21 | 28 | 35 | 42 | 49 | 56 | 63 | 70 | 77 | 84 | 91 | 98 | 105 | 112 | 119 | 126 | 133 | 140 | 147 | 154 | 161 | 168 | 175 | 182 |
| | 14 | 10.5 | 9.3 | 8.8 | 8.4 | 8.2 | 8 | 7.9 | 7.8 | 7.7 | 7.6 | 7.6 | 7.5 | 7.5 | 7.5 | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 | 7.3 | 7.3 | 7.3 | 7.3 | 7.3 |
| 8.. | 16 | 24 | 32 | 40 | 48 | 56 | 64 | 72 | 80 | 88 | 96 | 104 | 112 | 120 | 128 | 136 | 144 | 152 | 160 | 168 | 176 | 184 | 192 | 200 | 208 |
| | 16 | 12 | 10.7 | 10 | 9.6 | 9.3 | 9.1 | 9 | 8.8 | 8.8 | 8.7 | 8.7 | 8.6 | 8.6 | 8.5 | 8.5 | 8.5 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.3 | 8.3 | 8.3 |
| 9.. | 18 | 27 | 36 | 45 | 54 | 63 | 72 | 81 | 90 | 99 | 108 | 117 | 126 | 135 | 144 | 153 | 162 | 171 | 180 | 189 | 198 | 207 | 216 | 225 | 234 |
| | 18 | 13.5 | 12 | 11.3 | 10.8 | 10.5 | 10.3 | 10.1 | 10 | 9.9 | 9.8 | 9.8 | 9.7 | 9.6 | 9.6 | 9.6 | 9.5 | 9.5 | 9.5 | 9.5 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 |
| 10.. | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 | 140 | 150 | 160 | 170 | 180 | 190 | 200 | 210 | 220 | 230 | 240 | 250 | 260 |
| | 20 | 15 | 13.3 | 12.5 | 12 | 11.7 | 11.4 | 11.3 | 11.1 | 11 | 10.9 | 10.8 | 10.8 | 10.7 | 10.7 | 10.6 | 10.6 | 10.6 | 10.5 | 10.5 | 10.5 | 10.5 | 10.4 | 10.4 | 10.4 |
| 11.. | 22 | 33 | 44 | 55 | 66 | 77 | 88 | 99 | 110 | 121 | 132 | 143 | 154 | 165 | 176 | 187 | 198 | 209 | 220 | 231 | 242 | 253 | 264 | 275 | 286 |
| | 22 | 16.5 | 14.7 | 13.8 | 13.2 | 12.8 | 12.6 | 12.4 | 12.2 | 12.1 | 12 | 11.9 | 11.8 | 11.8 | 11.7 | 11.7 | 11.6 | 11.6 | 11.6 | 11.6 | 11.5 | 11.5 | 11.5 | 11.5 | 11.4 |
| 12.. | 24 | 36 | 48 | 60 | 72 | 84 | 96 | 108 | 120 | 132 | 144 | 156 | 168 | 180 | 192 | 204 | 216 | 228 | 240 | 252 | 264 | 276 | 288 | 300 | 312 |
| | 24 | 18 | 16 | 15 | 14.4 | 14 | 13.7 | 13.5 | 13.3 | 13.2 | 13.1 | 13 | 12.9 | 12.9 | 12.8 | 12.7 | 12.7 | 12.7 | 12.6 | 12.6 | 12.6 | 12.5 | 12.5 | 12.5 | 12.5 |
| 13.. | 26 | 39 | 52 | 65 | 78 | 91 | 104 | 117 | 130 | 143 | 156 | 169 | 182 | 195 | 208 | 221 | 234 | 247 | 260 | 273 | 286 | 299 | 312 | 325 | 338 |
| | 26 | 19.5 | 17.3 | 16.3 | 15.6 | 15.2 | 14.9 | 14.6 | 14.4 | 14.3 | 14.2 | 14.1 | 14 | 13.9 | 13.9 | 13.8 | 13.8 | 13.7 | 13.7 | 13.7 | 13.6 | 13.6 | 13.6 | 13.5 | 13.5 |
| 14.. | 28 | 42 | 56 | 70 | 84 | 98 | 112 | 126 | 140 | 154 | 168 | 182 | 196 | 210 | 224 | 238 | 252 | 266 | 280 | 294 | 308 | 322 | 336 | 350 | 364 |
| | 28 | 21 | 18.7 | 17.5 | 16.8 | 16.3 | 16 | 15.8 | 15.6 | 15.4 | 15.3 | 15.2 | 15.1 | 15 | 14.9 | 14.9 | 14.8 | 14.8 | 14.7 | 14.7 | 14.7 | 14.6 | 14.6 | 14.6 | 14.6 |
| 15.. | 30 | 45 | 60 | 75 | 90 | 105 | 120 | 135 | 150 | 165 | 180 | 195 | 210 | 225 | 240 | 255 | 270 | 285 | 300 | 315 | 330 | 345 | 360 | 375 | 390 |
| | 30 | 22.5 | 20 | 18.8 | 18 | 17.5 | 17.1 | 16.9 | 16.7 | 16.5 | 16.4 | 16.3 | 16.2 | 16.1 | 16 | 15.9 | 15.9 | 15.8 | 15.8 | 15.8 | 15.7 | 15.7 | 15.7 | 15.6 | 15.6 |

| | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 16.. | 32<br>32 | 48<br>24 | 64<br>21.3 | 80<br>20 | 96<br>19.2 | 112<br>18.7 | 128<br>18.3 | 144<br>18 | 160<br>17.8 | 176<br>17.6 | 192<br>17.5 | 208<br>17.3 | 224<br>17.2 | 240<br>17.1 | 256<br>17.1 | 272<br>17 | 288<br>16.9 | 304<br>16.9 | 320<br>16.8 | 336<br>16.8 | 352<br>16.8 | 368<br>16.7 | 384<br>16.7 | 400<br>16.7 | 416<br>16.6 |
| 17.. | 34<br>34 | 51<br>25.5 | 68<br>22.7 | 85<br>21.3 | 102<br>20.4 | 119<br>19.8 | 136<br>19.4 | 153<br>19.1 | 170<br>18.9 | 187<br>18.7 | 204<br>18.5 | 221<br>18.4 | 238<br>18.3 | 255<br>18.2 | 272<br>18.1 | 289<br>18.1 | 306<br>18 | 323<br>17.9 | 340<br>17.9 | 357<br>17.9 | 374<br>17.8 | 391<br>17.8 | 408<br>17.7 | 425<br>17.7 | 442<br>17.7 |
| 18.. | 36<br>36 | 54<br>27 | 72<br>24 | 90<br>22.5 | 108<br>21.6 | 126<br>21 | 144<br>20.6 | 162<br>20.3 | 180<br>20 | 198<br>19.8 | 216<br>19.6 | 234<br>19.5 | 252<br>19.4 | 270<br>19.3 | 288<br>19.2 | 306<br>19.1 | 324<br>19.1 | 342<br>19 | 360<br>18.9 | 378<br>18.9 | 396<br>18.9 | 414<br>18.8 | 432<br>18.8 | 450<br>18.8 | 468<br>18.7 |
| 19.. | 38<br>38 | 57<br>28.5 | 76<br>25.3 | 95<br>23.8 | 114<br>22.8 | 133<br>22.2 | 152<br>21.7 | 171<br>21.4 | 190<br>21.1 | 209<br>20.9 | 228<br>20.7 | 247<br>20.6 | 266<br>20.5 | 285<br>20.4 | 304<br>20.3 | 323<br>20.2 | 342<br>20.1 | 361<br>20.1 | 380<br>20 | 399<br>20 | 418<br>19.9 | 437<br>19.9 | 456<br>19.8 | 475<br>19.8 | 494<br>19.8 |
| 20.. | 40<br>40 | 60<br>30 | 80<br>26.7 | 100<br>25 | 120<br>24 | 140<br>23.3 | 160<br>22.9 | 180<br>22.5 | 200<br>22.2 | 220<br>22 | 240<br>21.8 | 260<br>21.7 | 280<br>21.5 | 300<br>21.4 | 320<br>21.3 | 340<br>21.3 | 360<br>21.2 | 380<br>21.1 | 400<br>21.1 | 420<br>21 | 440<br>21 | 460<br>20.9 | 480<br>20.9 | 500<br>20.8 | 520<br>20.8 |
| 21.. | 42<br>42 | 63<br>31.5 | 84<br>28 | 105<br>26.3 | 126<br>25.2 | 147<br>24.5 | 168<br>24 | 189<br>23.6 | 210<br>23.3 | 231<br>23.1 | 252<br>22.9 | 273<br>22.8 | 294<br>22.6 | 315<br>22.5 | 336<br>22.4 | 357<br>22.3 | 378<br>22.2 | 399<br>22.2 | 420<br>22.1 | 441<br>22.1 | 462<br>22 | 483<br>22 | 504<br>21.9 | 525<br>21.9 | 546<br>21.8 |
| 22.. | 44<br>44 | 66<br>33 | 88<br>29.3 | 110<br>27.5 | 132<br>26.4 | 154<br>25.7 | 176<br>25.1 | 198<br>24.8 | 220<br>24.4 | 242<br>24.2 | 264<br>24 | 286<br>23.8 | 308<br>23.7 | 330<br>23.6 | 352<br>23.5 | 374<br>23.4 | 396<br>23.3 | 418<br>23.2 | 440<br>23.2 | 462<br>23.1 | 484<br>23 | 506<br>23 | 528<br>23 | 550<br>22.9 | 572<br>22.9 |
| 23.. | 46<br>46 | 69<br>34.5 | 92<br>30.7 | 115<br>28.8 | 138<br>27.6 | 161<br>26.8 | 184<br>26.3 | 207<br>25.9 | 230<br>25.6 | 253<br>25.3 | 276<br>25.1 | 299<br>24.9 | 322<br>24.8 | 345<br>24.6 | 368<br>24.5 | 391<br>24.4 | 414<br>24 4 | 437<br>24.3 | 460<br>24.2 | 483<br>24.2 | 506<br>24.1 | 529<br>24 | 552<br>24 | 575<br>24 | 598<br>23.9 |
| 24.. | 48<br>48 | 72<br>36 | 96<br>32 | 120<br>30 | 144<br>28.8 | 168<br>28 | 192<br>27.4 | 216<br>27 | 240<br>26.7 | 264<br>26.4 | 288<br>26.2 | 312<br>26 | 336<br>25.8 | 360<br>25.7 | 384<br>25.6 | 408<br>25.5 | 432<br>25.4 | 456<br>25.3 | 480<br>25.3 | 504<br>25.2 | 528<br>25.1 | 552<br>25.1 | 576<br>25 | 600<br>25 | 624<br>25 |
| 25.. | 50<br>50 | 75<br>37.5 | 100<br>33.3 | 125<br>31.3 | 150<br>30 | 175<br>29.2 | 200<br>28.6 | 225<br>28.1 | 250<br>27.8 | 275<br>27.5 | 300<br>27.3 | 325<br>27.1 | 350<br>26.9 | 375<br>26.8 | 400<br>26.7 | 425<br>26.6 | 450<br>26.5 | 475<br>26.4 | 500<br>26.3 | 525<br>26.3 | 550<br>26.2 | 575<br>26.1 | 600<br>26.1 | 625<br>26 | 650<br>26 |

The use of the above table will best be explained by illustrations:

To enlarge six times with a lens of 15 centimeters (or inches) focal length. We find in the table under 6 *t.* and opposite 15, the figures $\frac{105}{17.5}$, hence the object must be 17.5, and the screen 105 centimeters (or inches) from the centre of the lens.

To reduce eight times with a lens of 19 centimeters (or inches) focus, the object must be 171 and the screen 21.4 centimeters (or inches) from centre of lens.

The table can be formulated thus: Where $p$ = focal length of lens, $a$ = distance from ground-glass to centre of lens and $b$ = distance from object to centre of lens, then $\frac{1}{a} + \frac{1}{b} = \frac{1}{p}$

## USUAL SIZES OF FRENCH, GERMAN AND ITALIAN DRY PLATES.

| French and German. | *Inches.* |
|---|---|
| 6½x 9 Centimetres | 2.5x 3.6 |
| 9 x12 " | 3.6x 4.7 |
| 12 x15 " | 4.7x 5.9 |
| 13 x18 " | 5.1x 7.0 |
| 12 x20 " | 4.7x 7.8 |
| 15 x21 " | 5.9x 8.2 |
| 15 x22 " | 5.9x 8.6 |
| 18 x24 " | 7.2x 9.4 |
| 21 x27 " | 8.2x10.6 |
| 24 x30 " | 9.4x11.8 |
| 27 x33 " | 10.6x12.9 |
| 27 x35 " | 10.6x13.7 |
| 30 x40 " | 11.8x15.7 |
| 40 x50 " | 15.7x19.6 |
| 50 x60 " | 19.6x23.6 |

| Italian. | *Inches.* |
|---|---|
| 9x12 Centimetres | 3.6x 4.7 |
| 12x16 " | 4.7x 6.3 |
| 12x18 " | 4.7x 7.2 |
| 13x18 " | 5.1x 7.0 |
| 12x20 " | 4.7x 7.8 |
| 18x24 " | 7.0x 9.4 |
| 21x27 " | 8.2x10.6 |
| 24x30 " | 9.4x11.8 |
| 27x33 " | 10.6x12.9 |
| 30x36 " | 11.8x14.1 |
| 40x50 " | 15.7x19.6 |
| 50x60 " | 19.6x23.6 |

## SIZES OF GLASS, MOUNTS, PAPER, ETC.

| | |
|---|---|
| Petite cards | 1⅝x3⅛ |
| One-ninth plate | 2 x2½ |
| One-sixth plate | 2¾x3¼ |
| One-fourth plate | 3¼x4¼ |
| Half plate | 4¼x5½ and 4¼x6½ |
| Half plate (English) | 4¾x6½ |
| Whole plate (4-4) | 6½x8½ |
| Extra 4-4 | 8 x10 |

Other sizes are expressed by inches.

### Sizes of Mounts.

| | | | |
|---|---|---|---|
| Stereoscopic | 3½x7, 4x7, 4¼x7, 4½x7, 5x8 | | |
| Victoria | 3¼x5 | Minette | 1½x2¾ |
| Imperial | 7⅞x9⅞ | Card | 2½x4⅛ |
| Boudoir | 5¼x8½ | Cabinet | 4¼x6½ |
| Panel | 4 x8¼ | Promenade | 4⅛x7⅞ |

### Sizes of Albumen Paper.

18x22¾, 20½x24½, 22x36, 26x40, 27x42.

Size of blotting paper 19x24

## FREEZING MIXTURES.

| Parts. | Reducing the Temperature From Degrees of the Celsius | To Thermometer. |
|---|---|---|
| 3 Nitrate of sodium + 4 Water | +13.2 deg. | — 5.3 deg. |
| 9 Phosphate of sodium + 4 dilute Nitric acid | +10 " | — 9 " |
| 3 Sulphate of sodium + 2 dilute Nitric acid | +10 " | —10 " |
| 1 Nitrate of sodium + 4 Water | | —10.6 " |
| 1 Chloride of potassium + 4 Water | | —11.8 " |
| 5 Sal ammoniac + 5 Saltpetre + 16 Water | +10 deg. | —12 " |
| 1 Nitrate of ammonia + 1 Water | +10 " | —15.5 " |
| 8 Sulphate of sodium + 5 conc. Sulphuric acid | +10 " | —17 " |
| 1 Sulphocyanate of Potass. + 1 Water | +18 " | —21 " |
| 1 Chloride of sodium + 3 Snow | | —21 " |
| 1 Sal ammoniac + 1 Saltpetre + 1 Water | + 8 deg. | —24 " |
| 3 Crystal. chloride of calcium + 1 Snow | | —36 " |
| 1 Snow + 1 dilute Sulphuric acid | — 5 deg. | —41 |

# LIST OF THE PRINCIPAL CHEMICALS USED IN PHOTOGRAPHY, WITH ENGLISH, LATIN, GERMAN AND FRENCH NAMES.

Compiled by C. L. LOCHMAN.

| ENGLISH. | LATIN. | GERMAN. | FRENCH. |
|---|---|---|---|
| Acid, Acetic | Acidum aceticum | Essigsäure | Acide acetique. |
| " " Glacial | Acidum aceticum glaciale. | Eiscessig | Vinaigre glacial. |
| " Boric; Boracic | Acidum boricum | Borsäure | Acide borique. |
| " Chrome | Acidum chromicum | Chromsäure | Acide chromique. |
| " Citric | Acidum citricum | Citronensäure | Acide citrique. |
| " Gallic | Acidum gallicum | Gallussäure | Acide gallique. |
| " Hydrochloric. *Muriatic.* | Acidum hydrochloricum. | Salzsäure | Acide chlorhydrique. |
| " Hydrofluoric | Acidum hydrofluoricum. | Fluss-säure | Acide fluorhydrique. |
| " Nitric | Acidum nitricum | Salpetersäure | Acide nitrique (azotique. |
| " Oxalic | Acidum oxalicum | Oxalsäure | Acide oxalique. |
| " Pyrogallic; Pyrogallol. | Acidum pyrogallicum. | Pyrogallussäure; Pyrogallol. | Acide pyrogallique. |
| " Tartaric | Acidum tartaricum | Weinsteinsäure | Acide tartarique. |
| " Sulphuric | Acidum sulphuricum | Schwefeisäure | Acide sulfurique. |
| " Tannic; Tannin | Acidum tannicum | Gerbsäure | Acide ittannique. |
| Alcohol, Ethyl | Alcohol | Weingeist | Alcool. |
| Alcohol, Wood | Alcohol methylicum | Holzgeist | Alcool methylique. |
| Alum, Ammonia | Aluminii et ammonii sulphas. | Ammoniak-Alaun | Sulphate d'alumine et d'ammoniaque. |
| Alum, Chrome | Chromii et potassii sulphas. | Chrom-Alaun | Alum chromi-potassique. |
| Alum, Potassa | Aluminii et potassii sulphas. | Kali-Alaun | Sulfate d'alumine et de potasse. |
| Amidol (*Diamidophenol Chlorhydrate.*) | Amidolum | Amidol | Amidol. |
| Ammonium Bichromate | Ammonii bichromicum | Dobletchromsaures Ammon. | Bichromate d'ammoniaque. |
| " Bromide | Ammonii bromidum | Ammoniumbromid | Bromure d'ammonium |
| " Carbonate | Ammonii carbonas | Ammoniumcarbonat | Carbonate d'ammoniaque. |
| " Chloride | Ammonii chloridum | Ammoniumchlorid | Chlorure d'ammonium. |
| " Citrate | Ammonii citras | Ammoniumcitrat | Citrate d'ammonium. |
| " Iodide | Ammonii iodidum | Ammoniumiodid | Iodure d'ammonium. |
| " Nitrate | Ammonii nitras | Ammoniumnitrat | Azotate d'ammionaque |
| " Salicylate | Ammonii salicylas | Ammoniumsalicylat | Salicylate d'ammonium. |
| " Succinate | Ammonii succinas | Ammoniumsuccinat | Succinate d'ammonium |
| " Sulphocyanate | Ammonii sulphocyanas | Ammoniumsulfocyanat. | Sulfcyanate d'ammonium. |
| " Sulphydrate | Liquor ammonii hydrosulphas. | Schwefelammonium-lösung; Ammonium-sulfhydrat. | Sulfhydrate d'ammonium. |
| " *Sulphide Solution* | | | |
| Barium Bromide | Barii bromidum | Baryumbromid | Bromure de baryum. |
| " Chloride | Barii chloridum | Baryumchlorid | Chlorure de baryum. |
| " Iodide | Barii iodidum | Baryumioid | Iodure de baryum, |
| " Nitrate | Barii nitras | Baryumnitrat | Nitrate de baryum. |
| Benzin | Benzinum | Petroleumbenzin | Benzine. |
| Benzol | Benzolum | Benzol | Benzole. |
| Bromine | Bromum; Brominium. | Brom | Brome. |
| Cadmium (metol) | Cadmium | Cadmium; Kadmium. | Cadmium. |
| " Bromide | Cadmii bromidum | Kadmiumbromid; Bromkadmium. | Bromure de cadmium. |
| " Chloride | Cadmii chloridum | Cadmiumchlorid | Chlorure de cadmium. |
| " Iodide | Cadmii iodidum | Kadmiumjodid; Jodkadmium. | Iodure de cadmium. |
| " Nitrate | Cadmii nitras | Cadmiumnitrat | Nitrate de cadmium. |
| Calcium Bromide | Calcii bromidum | Bromcalcium | Bromure de calcium. |
| " Carbonate | Calcii carbonas | Calciumcarbonat | Carbonate de calcium. |
| " Iodide | Calcii iodidum | Jodcalcium | Iodure de calcium. |
| Chloroform | Chloroformum | Chloroform | Chloroforme. |

## LIST OF THE PRINCIPAL CHEMICALS, ETC.—*Continued.*

| ENGLISH. | LATIN. | GERMAN. | FRENCH. |
|---|---|---|---|
| Collodion | Collodium | Collodion | Collodion. |
| Cobalt Chloride | Cobalti chloridum | Cobaltchlorid | Chlorure de cobalt. |
| Copper, metal | Cuprum | Kupfer | Cuivre. |
| " Bromide | Cupri bromidum | Kupferbromid | Bromure de cuivre. |
| " Chloride | Cupri chloridum | Kupferchlorid | Chlorure de cuivre |
| " Nitrate | Cupri nitras | Kupfernitrat | Nitrate de cuivre. |
| " Sulphate | Cupri sulphus | Kupfersulfat | Sulfate de cuivre. |
| Dextrin | Dextrinum | Stärkegummi | Dextrine. |
| Eikonogen | Eikonogenum | Eikonogen | Eikonogen. |
| Ether (Sulphuric) | Aether (sulphuricus) | Aether; Schwefeläther | Ether sulfurique. |
| Gelatin | Gelatina | Gelatin | Gelatine. |
| Glycerin | Glycerinum | Glycerin | Glycerine. |
| Glycin | Glycinum | Glycin | Glycine. |
| Gold | Aurum | Gold | Or. |
| " Terchloride | Auri chloridum | Goldchlorid | Chlorure d'or. |
| " and Sodium Chloride. | Auri et sodii chloridum | Natriumgoldchlorid | Chlorure d'or et de Sodium. |
| Gum Arabic | Gummi Arabicum | Arabisches Gummi | Gomme Arabique |
| Gum Sandarac | Sandarac | Sandarak | Sardaraque. |
| Gum Shellac | Ressina lacca | Lack Gummilack | Laque. |
| Hydroehinon; Hydroquinon. | Hydrochinonum | Hydrochinon | Hydrochinon. |
| Iodine | Iodum; Iodidium | Jod | Iode. |
| Iron (Metal) | Ferrum | Eisen | Fer. |
| " Ammonio-Sulphate. (*Ammonio-Ferric Sulphate.*) | Ferri et ammonii sulphas. | Ferro-ammonium sulphat. *Schwefelsaure Eisenoxydul-ammoniak.* | Sulfate d'ammoniaque et de fer. |
| " Chloride (Ferrous) (*Ferro Chloride*). | Ferro chloridum | Eisenchlorür (*Ferrochlorid*). | Chlorure de fer. (*Chlorure ferreux*). |
| " Chloride (Ferric). (*Ferric Chloride*). | Ferri chloridum. (*Ferri-sesquichloridum*). | Eisenchlorid (*Ferrichlorid*). | Perchlorure de fer. |
| " Iodide | Ferri iodidum | Eisenjodid (Jodeisen; Ferroiodid) | Iodure de fer. |
| " Oxalate (Ferrous) | Ferro-oxalas | Eisenoxalat | Oxalate de fer. |
| " Sulphate | Ferri sulphas | Ferrosulfat | Sulfate de fer. |
| Lead (Metal) | Plumbum | Blei | Plomb. |
| " Acetate | Plumbi acetas | Bleiacetat | Acetate de plomb. |
| " Chloride | Plumbi chloridum | Bleichlorid | Chlorure de plomb. |
| " Nitrate | Plumbi nitras | Bieinitrat | Nitrate de plomb. |
| Lithium Bromide | Lithii bromidum | Bromlithium | Bromure de lithium. |
| " Iodide | Lithii iodidum | Jodlithium | Iodure de lithium. |
| Magnesum Bromide | Magnesii bromidum | Brommagnesium | Bromure de magnesium |
| " Iodide | Magnesii iodidum | Jodmagnesium | Iodure de magnesium. |
| " Sulphate | Magnesii sulphas | Magnesiumsulfat | Sulfate de magnesie. |
| Mercury Bichloride | Hydrargyri bichloridum. | Aetzendes Quecksilber chlorid. | Deutochlorure de mercure. |
| Metol (*Monomethyl-paramido-meta-cresolate.*) | Metolum | Metol | Metole. |
| Oil of Lavender | Oleum Lavandulæ | Lavendelöl | Essence de Lavand. |
| Oil of Turpentine | Oleum Terebinthinæ. | Terpintinöl | Essence Terebinthine. |
| Para-amidophenol Hydrochlorate. | Para-amidolphenol-hydrochloras. | Paramidophenol-hydrochlorat. | Para-amidophenol-hydrochlorate. |
| Platinum Chloride | Platini chloridum | Platinchlorid | Perchlorure de platine. |
| Plaltino Potassium Chloride. | Platini et Potassii chloridum. | Kali-Platinumchlorid | Chlorure de platinum et de potassium. |
| Potassa, Sulphnrated; Silver of Sulphur. | Potassa sulphurata | Schwefelleber | Sulfure de potasse. |
| Potassium Acetate | Potassii acetas | Kaliumacetate | Acetate de potasse. |
| " Bichromate | Potassii bichromas | Kaliumbichromat | Bichromate de potasse. |
| " Bromide | Potassii bromidum | Kaliumbromid | Bromure de potassium. |
| " Carbonate | Potassii carbonas | Kaliumcarbonat | Carbonate de potasse. |
| " Citrate | Potassii citras | Kaliumcitrat | Citrate de potasse. |
| " Chloride | Potassii chloridum | Kaliumchlorid | Chlorure de potassium. |
| " Cyanide | Potassii cyanidum | Cyankalium | Cyanure de potassium. |
| " Ferricyanide | Potassii ferricyanidum | Ferridcyankalium | Ferricyanure de potassium. |
| " Ferrocyanide | Potassii ferrocyanidum | Ferrocyanklium | Ferrocyanure de potassium. |
| " Hydrate; Potassa. | Potassii hydras; Potassa. | Aetzkali | Potasse caustique. |

## LIST OF THE PRINCIPAL CHEMICALS, ETC.—*Continued.*

| ENGLISH. | LATIN. | GERMAN. | FRENCH. |
|---|---|---|---|
| Potassium Iodide | Potassii iodidum | Jodkalium | Iodure de potassium. |
| " Metabisulphite | Potassii metabisulphis. | Kalium-metabisufis | Metabisulfis de potassium. |
| " Nitrate | Potassii nitras | Kaliumnitrat | Nitrate de potasse. |
| " Oxalate, neutral. | Potassii oxalas | Kalium Oxalat, neutrales. | Oxalate de potasse. |
| " Permanganate | Potassii permanganas. | Kaliumpermanganate. | Permanganate de potasse. |
| " Sulphite | Potassii sulphis. | Kaliumsulfit. | Sulfite de potassium. |
| " Sulphocyanide | Potassii sulphocyanidum. | Kalium sulfocyanat; Rhodankalium. | Sulfocyanure de potassium. |
| Pyroxylin; Gun Cotton. | Pyroxylinum. | Collodionwolle; Schiess-baumwolle. | Pyroxyle; Fulmi-coton |
| Reducin | Reducinum | Reducin | Reducine. |
| Rodinal | Rodinalum | Rodinal | Rodinale. |
| Silver | Argentum | Silber. | Argent. |
| " Acetate | Argenti acetas | Silberacetat | Acetate d'argent. |
| " Citrate | Argenti citras | Silbercitrate | Citrate d'argent. |
| " Chloride | Argenti chloridum | Silberchlorid | Chlorure d'argent. |
| " Iodide | Argenti iodidum | Silberiodid | Iodure d'argent. |
| " Nitrate | Argenti nitras | Silbernitrat | Nitrate d argent. |
| " Oxide | Argenti oxidum | Silbor Oxyd | Oxyde d'argent. |
| " Sulphite | Argenti sulphas | Silbersulfat | Sulfate d'argent. |
| Sodium Acetate | Sodii acetas | Natriumacetate | Acetate de soude. |
| " Biborate; Borax. | Sodii biboras | Natriumborat, Borax. | Borate de soude. |
| " Bicarbonate | Sodii bicarbonas | Natriumbicarbonat | Bicarbonate de soude. |
| " Bromide | Sodii bromidum | Bromnatrium | Bromure de soude. |
| " Carbonate | Sodii carbonas | Natriumcarbonat | Carbonate de soude. |
| " Chloride | Sodii chloridum | Chlornatrium | Chlorure de soude. |
| " Citrate | Sodii citras | Natriumcitrat; Citronensaures Natron. | Citrate de soude. |
| " Hydrate; Soda | Sodii hydras; Soda | Aeznatron | Soude caustique. |
| " Hyposulphite or Thiosulphate. | Sodii hyposulphis | Unterschwefligsaures Natron. | Hyposulphite de soude. |
| " Iodide | Sodii iodidum | Jodnatrium | Iodure de soude. |
| " Sulphate | Sodii sulphas | Natriumsulfat | Sulfate de soude. |
| " Sulphite | Sodii sulphis | Natrium sulfit | Sulfite de soude. |
| " Tungstate | Sodii tungstas | Wolfraumsaures Natron | Tungstate de soude. |
| Starch | Amylum | Stärke; Stârkmehl | Amidon. |
| Strontium Bromide | Strontii bromidum | Bromstrontium | Bromure de strontium. |
| " Chloride | Strontii chlordum | Chlorstrontium | Chlorure de strontium. |
| " Iodide | Strontii iodidum | Jodstrontium | Iodure de strontium. |
| Tannin, see Tannic Acid. | | | |
| Turpentine, Crude or White. | Terebinthina communis | Geweiner Terpentin | Terebenthine commune |
| Uranium Bromide | Uranii bromidum | Bromuranium | Bromure d'uranium. |
| Uranium Nitrate | Uranii nitras | Salpetersaures Uranoxyd | Nitrate d'urane. |
| Water, Distilled | Aqua destillata | Destillirtes Wasser | Eau distillée. |
| Water of Ammonia | Aqua ammoniæ | Salmiakgeist; Ammoniak-Flussigkeit. | Eau d'ammoniaque. |
| Zinc Bromide | Zinci bromidum | Zinkbromid; Bromzink. | Bromure de zinc. |
| Zinc Chloride | Zinci chloridum | Chlorzink | Chlorure de zinc. |
| Zinc Iodide | Zinci iodidum | Zinkjodid; Jodzink | Iodure de zinc. |

# PHOTOGRAPHIC SCHOOLS OF INSTRUCTION.

## AMERICAN.

ANN ARBOR UNIVERSITY, MICHIGAN. *Director*, Prof. A. B. Stevens. Theory and Practice· Special Instructions in Photo-micrography; Lectures on Photo-mechanical Processes. It is obligatory for the students to have passed two courses in Chemistry. Examination and Diplomas.

CORNELL UNIVERSITY, ITHACA, N. Y. A School of Photography, under Direction of Prof. Mohr, is in connection with the University.

MAINE STATE COLLEGE, ORONO, MAINE. *Instructor*, Assist. Prof. D. W. Colby.

## EUROPEAN.

PHOTOGRAPHICAL LABORATORY OF THE POLYTECHNICUM IN CHARLOTTENBURG, BERLIN. Prof. Schlichting, *Director*. Prof. Dr. H. W. Vogel, *Instructor*. Chemistry, Physics, Drawing, Practical Exercises and Photo-mechanical Printing Methods.

BRAUNSCHWEIG DEPARTMENT OF POLYTECHNICAL SCHOOL. Prof. Dr. C. Koppe and Dr. Max Muller. Theory and Practice; Photo-micrography; Photo-grammetry.

KARLSRUHE. Prof. Dr. Schuberg. Theory and Practice in Studio and Field; Lectures.

MUNICH. Dr. M. Th. Edmann. Photography applied to the Mechanical Arts.

SCHLOSS GRÖNENBACH, BAVARIA. W. Cronenberg. Mechanical Printing Methods; Wet and Dry Processes.

VIENNA IMPERIAL POLYTECHNICUM. Prof. Dr. Joseph M. Eder. Elements of Photography and Photo-chemistry; Reproduction Methods.

VIENNA IMPERIAL INSTITUTE FOR PHOTOGRAPHIC PRACTICE, REPRODUCTION METHODS, AND MECHANICAL PRINTING. Prof. Dr. Joseph M. Eder, *Director*. Profs. Hans Lenhardt, Alex. Lainer, I. Hörwarter, C. Jasper. *Instructors*. Two Courses of Instruction. Drawing; Chemistry; Optics; Theories of Photographic Processes; Retouching Positives.

# LIST OF THE PRINCIPAL PHOTOGRAPHIC BOOKS PUBLISHED FROM SEPTEMBER 1, 1894, TO AUGUST 31, 1895.

## AMERICAN.

American Annual of Photography and Photographic Times Almanac for 1895. Edited by Walter E. Woodbury. New York: The Scovill & Adams Company.

Directory of Professional Photographers. New York: The Universal A and M Agency.

Sensitized Papers. How Made and How Used. By Henry C. Stiefel, Ph.D. New York: The Adams Press.

The International Annual for 1895. Edited by F. J. Harrison. New York: E. & H. T. Anthony & Co.

Lens Work for Amateurs. By Henry Orford. New York: Macmillan & Co.

Cyclopædic Photography. By E. L. Wilson. New York: E. L. Wilson.

Photogravure. By H. R. Blaney. New York: The Scovill & Adams Company.

Blue Book of Amateur Photographers. Edited by Walter Sprange, Beach Bluff, Mass. Walter Sprange.

Photographic Mosaics for 1895. Edited by E. L. Wilson. New York: E. L. Wilson.

The Modern Practice of Retouching Negatives. Ninth Edition. New York: The Scovill & Adams Company.

Lantern Slides, How to Make and Color Them. By D. L. Elmendorf. New York: E. & H. T. Anthony & Co.

Platinotype: Its Preparation and Manipulation. By Capt. W. de W. Abney, C.B., and Lyonel Clark, C.E. New York: The Scovill & Adams Company.

The Photographic Instructor. By Chas. Ehrmann and W. I. L. Adams. Fifth edition. New York: The Scovill & Adams Company.

## ENGLISH.

The Stereoscope and Stereoscopic Photography. By F. Drovin. Translated into English by Matthew Surface. Bradford: P. Lund & Co.

Photographic Enlargements; How To Make Them. By George Wheeler. Manchester: George Wheeler.

SNAP-SHOT PHOTOGRAPHY. By Martin J. Harding. Bradford: P. Lund & Co.

THE HALF-TONE PROCESS. By Julius Verfasser. Bradford: P. Lund & Co.

PHOTOGRAPHY ANNUAL FOR 1894. Edited by Henry Sturmey. London: Iliffe & Son.

THE YEAR BOOK OF PHOTOGRAPHY FOR 1895. Edited by T. C. Hepworth. London: Alexander & Shephard.

LANTERN SLIDES: THEIR PRODUCTION AND USE. By J. Pike. Bradford: P. Lund & Co.

AMATEUR PHOTOGRAPHERS' ANNUAL FOR 1895. Edited by E. J. Wall. London: Hazell Watson & Viney, Ltd.

LETTS' PHOTOGRAPHIC DIARY FOR 1895. Edited by H. Maclean. London: C. Letts & Co.

THE DARK-ROOM AND ITS EQUIPMENT. By H. J. L. J. Massé. London: P. Lund & Co.

DEVELOPERS: THEIR USE AND ABUSE. By R. Penlake. London: P. Lund & Co.

PHOTOGRAPHIC LENSES: HOW TO CHOOSE AND HOW TO USE THEM. By John A. Hodges. London: P. Lund & Co.

AN INTRODUCTION TO THE SCIENCE AND PRACTICE OF PHOTOGRAPHY. By Chapman Jones, F.I.C. Third Edition. London: Iliffe & Sons.

PROCESS WORK YEAR-BOOK. London: Penrose & Co.

EXTERIOR AND INTERIOR PHOTOGRAPHY. By F. W. Mills. London: Dawbarn & Ward.

THE CAMERA AND ITS APPURTENANCES. By H. J. L. J. Massé. London: P. Lund & Co.

THE PRACTICAL PHOTOGRAPHERS' FIRST HANDBOOK. By Matthew Surface. London: P. Lund & Co.

A DICTIONARY OF PHOTOGRAPHY. By E. J. Wall, F.R.P.S. Sixth edition. London: Hazell, Watson & Viney, Limited.

CARBON PRINTING. By E. J. Wall. London; Hazell, Watson & Viney.

PICTURE MAKING BY PHOTOGRAPHY. By H. P. Robinson. London: Hazell, Watson & Viney.

A HANDBOOK OF ILLUSTRATION. By A. Horsley Hinton. London: Dawbarn & Ward, Limited.

BURTON'S MODERN PHOTOGRAPHY. By W. K. Burton. Eleventh edition. London: Piper & Carter.

PHOTO CERAMICS. By W. Ethelbert Henry and H. Snowden Ward. London: Dawbarn & Ward.

PHOTOGRAPHIC AND OPTICAL ELECTRIC LAMPS. By Ranken Kennedy. London: Alabaster, Gatehouse & Co.

STENOPAIC, OR PINHOLE PHOTOGRAPHY. By F. W. Mills and A. C. Ponton. London: Dawbarn & Ward.

PHOTO-LITHOGRAPHY. By Geo. Fritz. Translated from the German by E. J. Wall. London: Dawbarn & Ward, Limited.

## GERMAN.

Photo Komik. Von Focus Sonnenspiegel. Düsseldorf: Schmitz und Olbertz.

Leitfaden der Retouche des Photographischen Bildes. Von Jean Paar. Düsseldorf: Ed. Liesgang.

Der Platindruck. Von Freihen von Hühl. Halle a/S: Wilhelm Knapp.

Die Photolithographie. Von George Fritz, Halle a/S: Wilhelm Knapp.

Photographische Chemie. Von R. Ed. Liesgang. Düsseldorf: Ed. Liesgang.

Darstellung der Natürlichen Farben. Von H. Krone. Weimar: Verlag der Deutschen Photographen Zeitung.

Photographisches Jahrbuch. 1895. Edited by Dr. Josef Maria Eder. Halle a/S: Wilhelm Knapp.

Kalender für Photographie. 1895. Edited by C. Hoffmann. Vienna: Montz Perles.

Photographischer Almanach und Kalender. 1895. Edited by Dr. E. Liesgang. Dusseldorf: Ed. Liesgang.

Deutscher Photographischen Kalender. 1895. Edited by K. Schwier. Weimar: Deutsche Photographen Zeitung Verlag.

Lehrbuch der Praktischen Photographie. Von Adolf Miethe. Halle a/S: Wihelm Knapp.

## FRENCH.

Le Mouvement. Par E. J. Marey. Paris: G. Masson.

Method Pratique pour le tirage des Epreuves de petit format par le procède du charbon. Par G. Chéri Rousseau. Paris: Gauthier-Villars et fils.

Les Lumières Artificielles en Photographie. Par H. Fourtier. Paris: Gauthier-Villars et fils.

Formulaire Classeur du Photo Club. Par MM. Fourtier, Bourgeois et Bucquet. Paris: Gauthier-Villars et fils.

Instructions Pratiques pour produire des Epreuves irréproachables au point de vue technique et artistique. Par A. Mullin. Paris: Gautier-Villars et fils.

Description et Usage d'un appareil Elémentaire de Photogrammetrie. Par Le Commandant V. Legros. Paris: Société d'Editions Scientifiques.

Manuel de Photochrome Interferentielle. Par A. Berthier. Paris: Gauthier-Villars et fils.

Dictionnaire Synonymique. Par Anthonny Guerronnan. Paris: Gauthier-Villars et fils.

## ITALIAN.

Fotochimica dei Sali di Mercurio e Processi Fotografica. By Prof. R. Namias. Modena: Namias & Co.

## UNITED STATES PATENTS.

SUITS for redress on account of infringement of patents are brought in the United States Circuit Court for the District where the defendant resides. Redress may be had through an injunction preventing further infringement and an accounting of the damages caused the patentee, or the profits, gains or advantages made by the infringer.

Until recently appeals from decisions rendered by the United States Circuit Court were necessarily taken to the Supreme Court of the United States, and, owing to the great amount of business done by the latter, a delay of at least four years was suffered by an appellee.

A new special Court, designated the Circuit Court of Appeals, has been provided. Appeals may hereafter be taken to this Court, and are likely to be reached and disposed of quite expeditiously. This is of particular advantage to patentees, in view of the fact that their monopolies run but a limited time.

Patents are issued in the name of the United States and under the seal of the Patent Office to any person who has invented or discovered any new and useful art, machine, manufacture, or composition of matter, or any new and useful improvement thereof, not known or used by others in this country, and not patented or described in any printed publication in this or any foreign country, before his invention or discovery thereof, and not in public use or on sale for more than two years prior to his application, unless the same is proved to have been abandoned; and by any person who, by his own industry, genius, efforts, and expense, has invented and produced any new and original design for a manufacture, bust, statue, alto-relievo, or bas-relief; any new and original design for the printing of woolen, silk, cotton, or other fabrics, any new and original impression, ornament, pattern, print, or picture to be printed, painted, cast, or otherwise placed on or worked into any article of manufacture; or any new, useful, and original shape or configuration of any article of manufacture, the same not having been known nor used by others before his invention or production thereof, nor patented nor described in any printed publication, upon payment of the fees required by law and other due proceedings had

Joint inventors are entitled to a joint patent; neither can claim one separately. Independent inventors of distinct and independent improvements in the same machine can not obtain a joint patent for their separate inventions; nor does the fact that one furnishes the capital and another makes the invention entitle them to make application as joint inventors; but in such case they may become joint patentees.

Every patent contains a grant to the patentee, his heirs or assigns, for the term of seventeen years, of the exclusive right to make, use, and vend the invention or discovery throughout the United States and the Territories, referring to the specification for the particulars thereof.

If it appear that the inventor, at the time of making his application, believed himself to be the first inventor or discoverer, a patent will not be refused on account of the invention or discovery, or any part thereof, having been known or used in any foreign country before his invention or discovery thereof, if it had not been before patented or described in any printed publication.

Letters Patent granted under a foreign government will not, while in force, prevent the inventor from obtaining a patent in the United States, unless the invention shall have been introduced into public use into the United States more than two years prior to the application. But every patent granted for an invention which is the subject of Letters

Patent still in force and previously granted to the same inventor in a foreign country will be so limited as to expire at the same time with such foreign patent, or, if there be more than one, at the same time with the one having the shortest unexpired term, but in no case will it be in force more than seventeen years.

### Applications.

Application for a patent must be made in writing to the Commissioner of Patents. The applicant must also file in the Patent Office a written description of the same, and of the manner and process of making, constructing, compounding, and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art or science to which it appertains, or with which it is most nearly connected, to make, construct, compound and use the same; and in case of a machine, he must explain the principle thereof, and the best mode in which he has contemplated applying that principle, so as to distinguish it from other inventions, and particularly point out and distinctly claim the part, improvement, or combination which he claims as his invention or discovery. The specification and claim must be signed by the inventor and attested by two witnesses.

The applicant shall make oath that he verily believes himself to be the original and first inventor or discoverer of the art, machine, manufacture, composition, or improvement for which he solicits a patent; that he does not know and does not believe the same was ever before known or used, and shall state of what country he is a citizen. Such oath may be made before any person within the United States authorized by law to administer oaths, or, when the applicant resides in a foreign country, before any minister, charge d'affaires, consul, or commercial agent holding commission under the Government of the United States, or before any notary public of the foreign country in which the applicant may be.

When the nature of the case admits of drawings, the applicant must furnish one copy signed by the inventor or his attorney in fact, and attested by two witnesses, to be filed in the Patent Office. In all cases which admit of representation by model, the applicant, if required by the Commissioner, shall furnish a model of convenient size to exhibit advantageously the several parts of his invention or discovery.

On the filing of such application and the payment of the fee required by law, if, on such examination, it appears that the claimant is justly entitled to a patent under the law, and that the same is sufficiently useful and important, the Commissioner will issue a patent therefor.

### Assignments.

Every patent or any interest therein shall be assignable in law by an instrument in writing; and the patentee, or his assigns or legal representatives may, in like manner, grant and convey an exclusive right under his patent to the whole or any specified part of the United States.

### Reissues.

A reissue is granted to the original patentee, his legal representatives, or the assignees of the entire interest when, by reason of a defective or insufficient specification, or by reason of the patentee claiming as his invention or discovery more than he had a right to claim as new, the original patent is inoperative or invalid, provided the error has arisen from inadvertence, accident, or mistake, and without any fraudulent or deceptive intention. The applications must be made and the specification sworn to by the inventors, if they be living.

### Caveats.

A caveat under the patent law is a notice given to the Office of the caveator's claim as inventor, in order to prevent the grant of a patent to another for the same alleged invention upon an application filed during the life of the caveat without notice to the caveator.

Any citizen of the United States who has made a new invention or discovery, and desires further time to mature the same, may, on payment of a fee of $10, file in the Patent Office a caveat setting forth the object and the distinguishing characteristics of the invention, and praying protection of his right until he shall have matured his invention. Such caveat shall be filed in the confidential archives of the Office and preserved in secrecy, and shall be operative for the term of one year from the filing thereof.

An alien has the same privilege, if he has resided in the United States one year next preceding the filing of his caveat, and has made oath of his intention to become a citizen.

The caveat must comprise a specification, oath, and, when the nature of the case admits of it, a drawing, and, like the application, must be limited to a single invention or improvement.

### Fees.

Fees must be paid in advance, and are as follows: On filing each original application for a patent, $15. On issuing each original patent, $20. In design cases: For three years and six months, $10; for seven years, $15; for fourteen years, $30. On filing each caveat, $10. On every application for the reissue of a patent, $30. On filing each disclaimer, $10. For certified copies of patents and other papers, including certified printed copies, ten cents per hundred words. For recording every assignment, agreement, power of attorney, or other paper, of three hundred words or under, $1; of over three hundred and under one thousand words, $2; of over one thousand words, $3. For copies of drawings, the reasonable cost of making them.

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## RECENT AMENDMENT TO THE RULES OF PRACTICE.

The following regulations for the conduct of proceedings in the Patent Office are established:

65. An applicant will be considered to persist in his claim for a patent without altering his specification in case he fail to act in prosecution of the same for six months after the Office action thereon, and thereupon the Examiner will make a re-examination of the case.

134. In appealable cases in which no limit of appeal is fixed, no appeal will be entertained by any tribunal in the Office unless taken within six months from the action which puts the case in condition for appeal, unless it be shown to the satisfaction of the Commissioner that such delay was unavoidable.

68. In every case pending before the Office more than five years, in which the record raises the presumption that there have been intentional delays in prosecution, the examiner may require the applicant to show cause why the case was not more rapidly prosecuted, and at the hearing thereon, or upon failure of the applicant to appear, the Examiner will determine, under all the circumstances of the case, whether there have been intentional and unreasonable delays in prosecution, and upon finding the fact to be so, he will reject the case for that reason.

Present Rules 65, 69, and 134 are repealed, and the present Rule 68 is renumbered 69.

## COPYRIGHT LAW OF THE UNITED STATES.

1. A *printed* copy of the title of the book, map, chart, dramatic or musical composition, engraving, cut, print, photograph, or chromo, or a *description* of the painting, drawing, statue, statuary, or model or design for a work of the fine arts, for which copyright is desired, must be delivered to the Librarian of Congress or deposited in the mail, within the United States, *prepaid*, addressed

LIBRARIAN OF CONGRESS, Washington, D. C.

This must be done on or before day of publication in this or any foreign country.

The *printed title* required may be a copy of the title page of such publications as have title pages. *In other cases the title must be printed expressly for copyright entry*, with name of claimant of copyright. The style of type is immaterial, and the print of a typewriter will be accepted. But a separate title is required for each entry, and *each* title must be printed on paper as large as commercial note. The title of a *periodical* must include the date and number; and each number of the periodical requires a separate entry of copyright.

2. The legal fee for *recording* each copyright claim is 50 cents, and for a *copy* of this record (or certificate of copyright under seal of the office) an additional fee of 50 cents is required, making $1, if certificate is wanted, which will be mailed as soon as reached in the records. Publications which are the production of persons not citizens or residents of the United States, the fee for recording title is $1, and 50 cents additional for a copy of the record. Certificates covering more than one entry in one certificate are not issued.

3. Not later than the day of publication in this country or abroad, two complete copies of the best edition of each book or other article must be delivered, or deposited in the mail within the United States, addressed

LIBRARIAN OF CONGRESS, Washington, D. C.,

to perfect the copyright.

The freight or postage must be prepaid, or the publications inclosed in parcels covered by printed Penalty Labels, furnished by the Librarian, in which case they will come FREE by mail (*not express*), without limit of weight, according to rulings of the Post Office Department. Books must be printed from type set or plates made in the United States; photographs from negatives made in the United States; chromos and lithographs from drawings on stone or transfers therefrom made in the United States.

Without the deposit of copies above required the copyright is void, and a penalty of $25 is incurred. No copy is required to be deposited elsewhere.

The law requires one copy of each new edition, wherein any substantial changes are made, to be deposited with the Librarian of Congress.

4. No copyright is valid unless notice is given by inserting in every copy published, on the title page or the page following, if it be a book; or if a map, chart, musical composition, print, cut, engraving, photograph, painting, drawing, chromo, statue, statuary, or model or design intended to be perfected as a work of the fine arts, by inscribing upon some portion thereof, or on the substance on which the same is mounted, the following words, viz.: "*Entered according to act of Congress, in the year* ———, *by* ———, *in the office of the Librarian of Congress, at Washington*," or at the option of the person entering the copyright, the words: "*Copyright, 18—, by* ———."

The law imposes a penalty of $100 upon any person who has not obtained copyright who shall insert the notice "*Entered according to act of Congress*," or "*Copyright*," etc., or words of the same import, in or upon any book or other article.

5. The copyright law secures to authors and their assigns the

exclusive right to translate or to dramatize any of their works; no notice or record is required to enforce this right.

6. The original term of copyright runs for twenty-eight years. *Within six months before* the end of that time, the author or designer, or his widow or children, may secure a renewal for the further term of fourteen years, making forty-two years in all. Applications for renewal must be accompanied by a printed title and fee; and by explicit statement of ownership, in the case of the author, or of relationship, in the case of his heirs, and must state definitely the date and place of entry of the original copyright. Within two months of date of renewal the record thereof must be advertised in an American newspaper for four weeks.

7. The time of publication is not limited by any law or regulation, but the courts have held that it should take place within a reasonable time. A copyright may be secured for a projected as well as for a completed work. But the law provides for no *caveat*, or notice of interference—only for actual entry of title.

8. Copyrights are assignable by any instrument of writing. Such assignment, to be valid, is to be recorded in the office of the Librarian of Congress within sixty days from execution. The fee for this record and certificate is one dollar, and for a certified copy of any record of assignment, one dollar.

9. A copy of the record (or duplicate certificate) of any copyright entry will be furnished under seal of the office, at the rate of fifty cents each.

10. In the case of books published in more than one volume, or of periodicals published in numbers, or of engravings, photographs, or other articles published with variations, a copyright must be entered for each volume or part of a book, or number of a periodical, or variety, as to style, title, or inscription, of any other article. To *complete* the copyright on a book published serially in a periodical, two copies of each serial part as well as of the complete work (if published separately), should be deposited.

11. To secure copyright for a painting, statue, or model or design intended to be perfected as a work of the fine arts, a definite title and description must accompany the application for copyright, and a mounted photograph of the same, as large as "cabinet size," mailed to the Librarian of Congress not later than the day of publication of the work or design.

The fine arts, for copyright purposes, include only painting and sculpture, and articles of merely ornamental and decorative art should be sent to the Patent Office, as subjects for Design Patents.

12. Copyrights cannot be granted upon Trade-Marks, nor upon names of companies, libraries, or articles, nor upon an idea or device, nor upon prints or labels intended to be used for any article of manufacture. If protection for such names or labels is desired, application must be made to the Patent Office, where they are registered, if admitted, at a fee of $6 for labels, and $25 for trade-marks.

13. The provisions as to copyright entry in the United States by foreign authors, etc., by act of Congress approved March 3, 1891 (which took effect July 1, 1891), are the same as the foregoing, except as to productions of persons, not citizens or residents, which must cover return postages, and are $1 for entry, or $1.50 for entry and certificate of entry (equivalent to 4*s*. 5*d*. or 6*s*. 7*d*.). All publications must be delivered to the Librarian at Washington free of charge. The free penalty labels cannot be used outside of the United States.

The right of citizens or subjects of a foreign nation to copyright in the United States extends by Presidential proclamations of July 1, 1891, April 15, and October 31, 1892, to Great Britain, France, Belgium, Switzerland, Germany, and Italy.

14. Every applicant for a copyright should state distinctly the full name and residence of the claimant, and whether the right is claimed as author, designer, or proprietor. No affidavit or witness to the application is required.

# RECORD OF PHOTOGRAPHIC PATENTS.

ISSUED BY THE UNITED STATES PATENT OFFICE FROM SEPTEMBER 1, 1894, TO AUGUST 31, 1895, INCLUSIVE, WITH NAMES OF PATENTEES.

COMPILED BY F. C. BEACH.

525,439.—Camera Shutters.
J. E. BLACKMORE, Newark, N. J.

525,458.—Photograph Mount.
D. R. HANAWALT, Philadelphia, Pa.

525,512.—Sensitized Photographic Vapor.
W. H. PRESTWICH, London, England.

525,602.—Tray Rocking Machine.
JOSEPH HESS, Mifflington, Pa.

525,608.—Photograph Print Mounter.
H. A. LESURE and D. D. DUNKLEE, Greenfield, Mass.

525,654.—Photographic View Finder.
J. J. HICKS, London, England.

525,719.—Cabinet Album.
J. M. RAY, Hamilton, Ohio.

525,849.—Apparatus for Developing, etc., Photographs.
ELMER F. MACKUSICK, New York.

525,899.—Photographic Flash-light.
ALEXANDER HENSLEY, Philadelphia, Pa.

525,991.—Series Photographic Camera.
MAX MEYER, Munich, Germany.

526,445.—Folding Roll-holding Camera.
DAVID H. HOUSTON, Hunter, N. D.

526,446.—Roll-holding Camera.
DAVID H. HOUSTON, Hunter, N. D.

526,471.—Camera Shutter.
GEORGE A. WATERS, Lansingburg, N. Y,

526,661.—Flash-light Burner.
MELVIN DE VER WESTCOTT, Cortlandt, N. Y.

526,662.—Flash-light Burner.
MELVIN DE VER WESTCOTT, Cortlandt, N Y.

527,056.—Photographic Head and Body Rest.
WILLIAM M. GILSON, Blanchard, Iowa.

527,204.—Album.
CHRISTIAN JAEGER, Philadelphia, Pa.

527,315.—Photographic Burnisher.
WARREN H. BOLES, Syracuse, N. Y.

527,841.—Panoramic Camera.
MATHIAS FLAMMANG, Newark, N. J., assignor to the SCOVILL & ADAMS Co. of Connecticut.

528,140.—Camera for Chrom-photography.
JAMES E. BLACKMORE, Newark, N. J.

528,155.—Lens for Optical Purposes.
C. P. Goerz and E. Von Hoegh, Wilmersdorf, Germany.

528,176.—Magazine Camera.
Geo. P. C. Marionez, Boulogne-sur-Mer.

528,515.—Flash Light Compound.
A. Hemsley, Philadelphia, Pa.

529,183.—Machine for Mounting Photographic Prints.
James W. McCabe, New York, N. Y.

529,369 —Camera.
Alois Delug, Munich, Germany.

529,820.—Focal-plane Shutter.
John E. Thornton and Edgar Pickard, Altringham, England.

530,100.—Plate Holder.
Mathias Flammang, Newark. N. J., assignor to the Scovill & Adams Co. of Connecticut.

530,327.—Tension Spool for Roll-holders.
Theodore Minot Clark, Newton, Mass.

530,486.—Shutter Mechanism for Cameras.
Theodore Vilhelm Jensen, Copenhagen, Denmark.

530,955.—Folding Camera.
Gustave D. Milburn, Rochester, N. Y.

530,965.—Hypo-Eliminator.
Albert Schmidt, Berlin, Germany.

531,012.—Photographic Plate-holder.
John E. Thornton and Edgar Pickard, Altringham, Eng.

531,040.—Photochromoscope and Photochromoscope Camera.
Frederic E. Ives, Philadelphia, Pa.

531,416.—Folding Photographic Camera.
Henry Hill and Arthur L. Adams, London, England.

531,915.—Flash-light Burner.
H. C. Fairchild, Sandy Hook, Conn.

531,994.—Lens.
L. Gathmann, Chicago, Ill.

532,135.—Lens Measuring Instruments.
Robt. H. Biegel, Denver, Col.

532,173.—Process of Printing Photographs on Textile Fabrics.
Ralph Martin, St. Paul, Minn.

532,326.—Diaphragm for Camera.
Max Levy, Philadelphia, Pa.

532,327.—Diagram for Photographic Lens Tubes.
Max Levy, Philadelphia, Pa.

532,398.—Photographic Objective.
Paul Rudolph, Jena, Germany.

532,517.—Tripod.
R. Ancock, Utica, N. Y.

532,571.—Photograph Holder.
Erick Lund and J. Kuelberg, Minneapolis, Minn.

532,639.—Photographic Flash-Light.
Chas. Clifford and F. Clifford, Muscatine, Iowa.

532,751.—Film Holder.
N. C. Bartlett and E. E. Edgerton, Chicago, Ill.

532,775.—Photographic Print Washer.

532,797.—Flash-light Device.
T. H. Macdonald, Bridgeport, Conn.

532,844.—Background Support.
W. Erueman, Brooklyn, N. Y.

533,125.—Folding Picture Frame.
H. R. Hinckley, Waterbury, Conn.

533,322.—Process of Marking Negatives.
J. Stanton, Baldwinsville, N. Y.

533,325.—Combined Telescope, Microscope and Camera.
R. L. Stevens, Ward, Pa.

533,437.—Combined Album and Bible.
G. Clay, Philadelphia, Pa.

533,618.—Roll-holding Camera.
Christian H. Stoelting, Chicago, Ill., Assignor to Aefred C. Kemper, Chicago.

533,752.—Photographic Print Holder.
Henry A. Stimson & Chas. Isaacson, South Superior, Wis.

534,115.—Magazine Camera.
Albert Lundelins, Port Jervis, N. Y.

534,337.—Photographic Shutter.
Franz J. Mathein, New Haven, Conn., assignor to The Scovill & Adams Co. New York.

534,440.—Photographic Shutter.
Fred. H. Kelley, Boston, Mass.

534,583.—Apparatus for Projecting Images on to Distant Bodies.
R. A. Scott, Acton, England.

534,912.—Tripod or Camera Support.
Enoch W. Perry, Jr., New York, N. Y.

535,850.—Photographic Curtain Shutter.
Walter Oehemke, Berlin, assignor to C. P. Goerz Schöneberg, Germany.

535,897.—Lens for Optical Purposes.
Carl P. Goerz, Schöneberg, and Emil von Hoegh, Wilmersdorf, Germany.

536,105.—Field-of-view Divider-Shutter.
Edwin Stowell, Fairhaven, Mass.

536,178.—Photographic Roll-Holder
Erastus B. Barker, Newark, N. J., assignor to E. & H. T. Anthony & Co., New York.

536,242.—Photographic Shutter.
Abner G. Tisdell, Scranton, Pa.

536,253.—Photographic Shutter.
Washington I. Adams, Montclair, N. J., assignor to The Scovill & Adams Co,, New York, N. Y.

536,276.—Flash Light Mechanism.
E. D. Evans, Ithaca, N. Y.

536,291.—Photgraphic Retoucher.
Arthur E. Peck, Minneapolis, Minn.

536,514.—Magazine Camera.
MARIUS CONSTANTIN GUITON DE GIRAUDY, Marseilles, France.

536,569.—Phantoscope.
CHARLES F. JENKINS, Richmond, Ind.

536,592.—Panoramic Cabinet.
A. A. AGUERO, New York, N. Y.

536,790.—Flash-light Apparatus.
GEORGE T. SHIRAS, Allegheny, Pa.

536,820.—Magazine Camera.
WILLIAM D. ROBINSON, Philadelphia, Pa.

537,442.—Machine for Embossing Photographs.
CLATONIA J. DORTICUS, Newton, N. J.

537,497.—Photographic Camera.
ERASTUS B. BARKER, Newark, N. Y.

537,916.—Photographic Shutter.
FRANK A. BROWNELL, Rochester, N. Y., assignor to the Eastman Kodak Co.

537,968.—Photographic Print or Negative Washer.
CLATONIA J. DORTICUS, Newton, N. J.

538,182.—Achromatic Dispersing-Lens for Lens Systems, &c.
PAUL RUDOLPH, Jena, Germany, assignor to the firm of

538,578.—Photographers' Flash-Light Apparatus.
W. B. FARWELL, San Francisco.

538,616.—Mount for Photographic or other similar objects.
E. W. LUNDAHL, Somerville, Mass.

538,736.—Magazine Camera.
J. MARCHALL and L. JONX, Paris, France.
Carl Zeiss, same place.

538,806.—Magazine Camera.
CHARLES B. WHITTINGTON, Janesville, Wis.

538,946.—Photographic Camera.
MAX BAUER, Greenville, N. J.

539,077.—Flash-Light Mechanism.
MARION W. NEWCOMB, Salt Lake City, Utah.

539,135.—Frame for Pictures.
M. E. C. JULIEN, New Bedford, Mass.

539,370.—Lens.
HENRY H. TURNER and JOHN C. REICH, Rochester, N. Y.

539,368.—Process of Making Negative Plates.
W. S. PHILLIPS, Seattle, Washington.

539,557.—Photographic Plate Holder.
M. A. STÜBEL, Dresden, Germany.

539,713.—Photographic Film Roll.
SAMUEL N. TURNER, Boston, Mass.

539,848.—Machine for Coating Paper with Emulsion.
CHARLES E. WOODWARD, St. Louis, Mo.

540,011.—Folding Mirror Album, etc.
P. WIEDERER, Stapleton, N. Y.

540,122.—Lens.
HAROLD D. TAYLOR, York, England.

540,414.—Collapsible Magic Lantern.
A. Wrench, London, England.

540,434.—Camera-Stand.
Adam W. Gilfillan, Ferndale, Cal.

540,545.—Series Photographic Camera.
Robert D. Gray, New York, N. Y.

540,611.—Stand for Supporting Cameras, etc.
W. H. Fisher and R. P. Palmer, Bond Hill, Cincinnati, O.

540,660.—Picture Exhibitor.
N. E. Hausen, Decatur, Ill,

540,964.—Photographic Plate-Holder.
B. J. Edwards, London. England.

541,006.—Vignetting Attachment for Photographic Cameras.
Roselle S. Peck, Taylorville, Ill.

541,186.—Magazine Camera.
Herbert Smith, London, England.

541,188.—Magazine Plate-Holder.
Auguste Tournier, Lyons, France.

541,242.—Automatic Regulating Device for Flashing-Light Apparatus.
Friedrich A. E. Lechner, Laurahütte, Germany.

541,423.—Roll Holding Camera.
W. H. Crane and J. R. Hickman. Philadelphia, Pa.

541,503.—Machine for Trimming or Cutting Photographs.
Charles L. Razoux, Boston, Mass.

541,506.—Photographic Printing Frame.
Chas. R. Schilling, St. Louis, Mo.

541,670.—Brush for Applying Sensitizing Solutions.
Edward A. Osse, Baltimore, Md.

541,832.—Magazine Camera.
Max Boelte, Los Angeles, Cal.

541,836.—Translucent Pictures.
A. Von Cotzhausen, Milwaukee, Wis.

542,113.—Photographic Album Support.
G. Schwab, New York, N. Y.

542,321.—Method by which Pictures Projected upon Screens by Magic Lanterns are Seen in Relief.
John Anderton, Birmingham, England.

542,334.—Roll-Holder, Camera and Picture Exhibitor.
W. V. Esmond, Chicago, Ill.

542,756.—Combined Centrifugal Emulsor and Separator.
M. Ekenberg, Stockholm, Sweden.

542,764.—Photographic Shutter.
L. J. R. Holst, Amsterdam, Netherlands.

542,785.—Producing Colored Gelatine Pictures.
F. Thuringer, Nuremberg, Germany.

542,887.—Camera Swing-Back Adjuster.
H. J. Hall, Wickford, R. I.

543,009.—Attachment for Magic Lanterns or Stereopticons.
C. Goodyear, Jr., New York, N. Y.

543,503.—Sensitive Non-Halation Plate.
C. F. Oakley, London, England.

543,585.—Photographic Plate-Holder.
J. Stock, New York, N. Y.

543,639.—Flash-Light Machine.
L. G. Bigelow, St. Joseph, Mo.

544,466.—Tripod.
W. H. Fisher, Cincinnati, O.

544,480.—Series Photographic Camera.
G. Demeny, Devallois-Perret, France.

544,193.—Magazine Camera.
J. N. Wigle, Ruthven, Canada.

544,666.—Stereoscopic Print.
L. D. Duhauron, Algiers, Africa.

544,669.—Automatic Photographic Camera.
E. J. Gregory, Sacramento, Cal.

544,681.—Photographic Retoucher.
C. B. Mortland, St. Louis, Mo.

544,859.—Vignetter.
F. Machette, Philadelphia, Pa.

545,192.—Photograph Holder and Exhibitor.
H. Borgersen, Chicago, Ill.

545,422.—Reproducing Device.
C. A. Chase, Chicago, Ill.

545,423.—Stereopticon Panorama Machine.
C. A. Chase, Chicago, Ill.

### Design Patents.

23,692.—Photographic Card Mount.
J. P. Odgers, Philadelphia, Pa.

23,856.—Picture Frame.
R. Liebmann, New York, N. Y.

24,158.—Card Mount.
J. P. Odgers, Philadelphia, Pa.

### Trade Mark.

26,715.—Platinite Chemicals for use in Photography.
E. and H. T. Anthony & Co., New York, N. Y.

26,919.—Optical Goods including Spectacles, Lenses, Test-Cases and Gauges.
"A. O. Co." *American Optical Co.*, Southbridge, Mass.

26,925.—Photographic Paper.
"Cigarette." G. Gennert, Greenville, N. J.

# RATES OF DOMESTIC POSTAGE

TO ANY PART OF THE UNITED STATES, CANADA, OR MEXICO.

SEE NOTE H.

| | cts. | oz. | See Spec'l Note. |
|---|---|---|---|
| Address Tags | 1 | 1 | *a* |
| Bill Heads | 1 | 1 | *a* |
| Blotters (printed) | 1 | 1 | *a* |
| Blue Prints | 1 | 2 | *d* |
| Books, printed | 1 | 2 | *d* |
| Cards, playing | 1 | 1 | *a* |
| " printed | 1 | 2 | *a* |
| " business | 1 | 2 | *a* |
| " Christmas, etc.‡ | 1 | 2 | *a* |
| " Easter‡ | 1 | 2 | *a* |
| " New Year‡ | 1 | 2 | *a* |
| Chromos‡ | 1 | 2 | *a* |
| Catalogues | 1 | 2 | *d* |
| Circulars | 1 | 2 | *d* |
| Coins | 1 | 1 | *a b* |
| Copy (MSS.) | 2 | 1 | *e* |
| " (with proof sheets) | 1 | 2 | *e* |
| Crayon | 1 | 1 | |
| Desk Blotters | 1 | 1 | *a* |
| Drawings / Designs (Pen or Pencil) | 1 | 1 | * *e* |
| Easter Cards‡ | 1 | 2 | *a* |
| Engravings | 1 | 2 | *a* |
| Handbills | 1 | 2 | *a* |
| Letters | 2 | 1 | *e* |
| Labels (printed) | 1 | 2 | *a* |
| Lithographs | 1 | 2 | *a* |
| Manifold Letters | 2 | 1 | *e* |
| Manuscript | 2 | 1 | *e* |
| Magazines | 1 | 4 | *d* |
| Merchandise | 1 | 1 | *a b* |
| Maps (printed) | 1 | 2 | *e* |
| Newspapers | 1 | 4 | *d* |
| New Year Cards‡ | 1 | 2 | |
| Packages, sealed | 2 | 1 | *b* |
| Packages, unsealed | 1 | 1 | † *b* |
| Pamphlets | 1 | 2 | *d* |
| Patterns (cut) | 1 | 1 | *a* |
| Periodicals | 1 | 4 | *d* |
| PHOTOGRAPHS | 1 | 2 | *d* |
| Pictures (scrap) | 1 | 2 | |
| Playing Cards | 1 | 1 | *a* |
| Postal Cards | 1 | ea. | *f* |
| Printed Matter (*not merchandise or samples*) | 1 | 2 | *d* |
| Printed Envelopes | 1 | 1 | *a* |
| Prospectuses | 1 | 2 | *d* |
| Proof Sheets | 1 | 2 | *d g* |
| Plans (in writing) | 2 | 1 | *e* |
| Registration | 8 | ea. | *i* |
| Samples | 1 | 1 | *b* |
| Sample copies of regular publications mailed by publisher (second-class) | 1 | lb. | |
| Sample copies of regular publications not mailed by publisher | 1 | 4 | *a* |
| Scrap Pictures | 1 | 2 | *a* |
| Seeds, Plants, etc | 1 | 2 | |
| Specie | 1 | 1 | *a b* |
| Stereoscopic Views | 1 | 2 | *d* |
| Tickets | 1 | 2 | *a* |
| Type Writer Work | 2 | 1 | *e* |
| Valentines (if printed without embellishment with silk, satin, etc) | 1 | 2 | *a* |
| Visiting Cards (printed) | 1 | 2 | *a* |

* If pen or pencil drawings contain no written letters, figures, or words, they are fourth class matter, otherwise first class.

† May be either third or fourth class.

‡ Third class matter if printed on paper; if on silk, cotton, satin, canvas, or other material than paper or paper board, fourth class matter.

## GENERAL NOTES.

Cards, circulars, catalogues, etc., relating to the business of one or more firms, and different articles of all kinds and classes, may be placed in the same package, provided that the highest rate of postage that any part of the contents is subject to shall be prepaid on the whole package.

The following articles are unmailable, and will not be dispatched in any case:—Spirituous, malt, or vinous liquids, poisons, explosive matter, inflammable articles, live or dead animals, insects (except queen bees when safely secured), substances exhaling a bad odor, fresh fruits and vegetables, obscene or indecent books, prints, writings, or papers; all postal cards or letters on the envelopes of which lewd, obscene, or lascivious deliniations, offensive duns, epithets, terms, or language are written or printed, all matter concerning lotteries or schemes devised and intended to defraud the public, or for the purpose of obtaining money under false pretences, and all mail matter not addressed to a post-office or to no particular person, firm, company, or publication.

SPECIAL DELIVERY.—Any mail matter, when bearing, in addition to the regular postage, a "special delivery" stamp (face value, ten cents), will be immediately delivered by special messenger on its arrival at destination, between the hours of 7 A.M. and 7 P.M., and within one mile from the post-office, if it be not a letter-carrier office. At letter-carrier offices special delivery is obligatory within the carrier limits, and between the hours of 7 A.M. and 11 P.M.

*Note A.*

FOURTH CLASS MATTER—SAMPLES AND MERCHANDISE.—Weight limited to 4 pounds. Postage must be fully prepaid. The rate is *one cent an ounce or fraction thereof.* Merchandise may have printing on it or on the wrapper. Written marks, in addition to the address, are allowed on Fourth Class matter, as follows:—The name and address of sender preceded by the word "From"; and any names, numbers, marks, or letters for the purpose of description. A request to the delivering Postmaster may also be written asking him to notify sender if the package is not delivered; also an ordinary request to return to the sender in case of non-delivery.

*Note B.*

ARTICLES of the Fourth Class liable to injure or deface the mails, such as glass, needles, nails, pens, etc., must first be placed in a bag, box or open envelope, which must then be inclosed in another outside tube or box made of metal or hardwood, without sharp corners or edges and having a sliding clasp or screw lid, thus securing the articles in a double package; if the articles are fragile, they must be packed with sawdust, cotton or other packing material in the inside pocket. Powdered articles, such as flour, sugar, etc., may be inclosed in a transparent bag or envelope, and must be securely packed so as to prevent breaking. Admissible liquids and oils (not exceeding 4 ounces liquid measure), pastes, salves or articles easily liquefiable, must conform to the following conditions: When in glass bottles or vials, such bottles or vials must be strong enough to stand the shock of handling in the mails, and must be inclosed in a wooden or papier-mache block or tube *not less than three-sixteenths of an inch thick* in the thinnest part, strong enough to support the weight of mails piled in bags and resist rough handling; and there must be pro-

vided, between the bottle and its wooden case, a cushion of cork crumbs, cotton, felt, asbestos, or some other absorbent, sufficient to protect the glass from shock in handling; the block or tube impervious to liquids, including oils, etc., to be closed by a tightly fitting screw-lid of wood or metal, with a rubber or other pad so adjusted as to make the block or tube water-tight and to prevent the leakage of the contents in case of breaking of the glass. When inclosed in a tin cylinder, metal case or tube, such cylinder, case or tube should have a screw-lid with a rubber or cork cushion inside in order to make the same water-tight, and should be securely fastened in a wooden or papier-mache block (open only at one end), and not less in thickness and strength than above prescribed. Manufacturers or dealers intending to transmit articles or samples in considerable quantities, should submit a sample package, showing their mode of packing, to the Postmaster at the mailing office, who will see that the conditions of this section are carefully observed.

*Note D.*

THIRD CLASS MATTER—PREPAYMENT.—Postage must be fully prepaid, otherwise the matter will be "held for postage." The rate is *one cent for every two ounces or fraction thereof. The limit of weight is* 4 pounds, except on single books. WRITING.—No writing is permitted on Third Class matter, except as follows: The name and address of the sender on the outside or inside of package, preceded by the word "From," and any printing not in the nature of personal correspondence. The sender is further allowed to mark a word or passage in a book or paper to which he desires to call special attention. He may also write a simple inscription or dedication upon the cover or blank leaf of a book or pamphlet. The date, address and signature of a circular may be written. Any other writing on Third Class matter will subject the package to letter rates of postage, and may render the sender liable to a fine of ten dollars. *Photographs* and *blue prints* must bear no other writing than the name of the sender.

WRAPPING.—Mail matter of the Third Class must be so wrapped or inclosed that it can be readily examined without destroying the wrapper; otherwise it will be subject to postage at the First Class rate (two cents per ounce), as will all articles inclosed in sealed envelopes with clipped ends, sides or corners, or in boxes with covers secured by nails, and all packages the wrappers of which are secured to the inclosure by postage stamps.

*Note E.*

FIRST CLASS.—This class includes letters, postal cards, sealed packages, all matter wholly or partly in writing (whether manuscript or produced by type-writer or copying press), drawings, designs, plans and maps, if they contain descriptive words, letters or figures in writing, produced by hand, manuscript for publication not accompanied by proof-sheets, and all personal correspondence, whether in writing or in print. (See under heads "Third Class," "Fourth Class," notes "A" and "D," certain writing permitted in or on articles of those classes.)

The rate of postage on mail matter of the First Class (sealed or unsealed) is *two cents for each ounce or fraction thereof*, excepting postal cards, and excepting also letters for *local delivery* posted at the post-offices where no letter-carriers are employed, in which case the rate is *one cent per ounce or fraction thereof.*

The law provides that the postage on all mail matter of the First Class shall be prepaid only by postage stamps or by inclosure in government

stamped envelopes, and that any article of this class (not entitled by law to free transmission in the mails) deposited in a post-office wholly unpaid or prepaid *less than one full rate, cannot be forwarded or delivered*, but must be "held for postage." LIMIT OF WEIGHT.—There is no limit to the weight of letters or packages of First Class matter. WRAPPING OR ENCLOSURE.—Mail matter of the First Class may be wrapped or enclosed in any manner that the sender may desire. RETURN.—Letters not delivered will be returned to writer free, if a request to that effect is placed on the envelope. FORWARDING.—A letter will be forwarded by the Postmaster who may hold it, to another post-office, at the request of the person to whom the letter is addressed. Letters addressed to the care of another person, or erroneously delivered, may be redirected and returned within a reasonable time to post-office, and will be forwarded without additional charge.

*The putting on of requests to return the matter to the sender in case of non-delivery is recommended by the Post-Office Department—not on first-class alone, but on all matter.*

*Note F.*

POSTAL CARDS.—No cards are "Postal Cards" except those issued by authority of the Postmaster-General (the imitation of which is forbidden and punished by law); and so-called "Postal Cards" issued by private parties are subject to letter rates of postage when they contain any written matter whatever in addition to the date, and the name of the addressee and of the sender, and the correction of mere typographical errors herein. Nothing whatever may be attached to a Postal Card except an address label, which may be pasted to the *address side*, and no printing or writing is permitted upon the address side of Postal Cards, except that imprinted thereon at the manufactory and such as may be necessary for the proper direction of the same. Postal Cards are unmailable as such when incomplete or mutilated, and in all cases where any of the above conditions are not complied with. Undelivered single Postal Cards are not returned to senders.

*Note G.*

PROOF SHEETS may be corrected or uncorrected, with or without the original manuscript, additions to or alterations in the matter, or directions as to the typographical part of the work; but directions in writing as to binding, quality of paper, etc., are not permissible unless the letter rate of postage be paid.

*Note H.*

CANADA AND MEXICO.—Matter mailed in the United States, addressed to Mexico, is subject to the same postage rates and conditions as it would be if it were addressed for delivery in the United States, except that articles of miscellaneous merchandise (fourth-class matter) not sent as *bona-fide* trade samples, are required to be sent by "Parcels Post," and that the following articles are *absolutely excluded* from the mails without regard to the amount of postage prepaid, or the manner in which they are wrapped, viz.:

All sealed packages, other than letters in their usual and ordinary form; *all* packages (including packages of second-class matter, which weigh more than 4 pounds 6 ounces), except such as are sent by "Parcels Post;" liquids, pastes, confections and fatty substances; publications which violate any copyright law in Mexico.

Single volumes of printed books in *unsealed* packages, are transmissible to Mexico in the regular mails without limit as to weight.

"*Commercial Papers*," and *bona-fide* trade samples are transmissible to Mexico in the regular mails at the postage rate given above, opposite "Commercial Papers" and "Samples of Merchandise," respectively. See also Note 14, pp. 925 and 927 of the *United States Official Postal Guide* for January, 1894.

Matter mailed in the United States, addressed to Canada, is subject to the same postage rates and conditions as it would be if it were addressed for delivery in the United States, except that "Commercial Papers" are transmissible at the postage rate given above opposite "Commercial Papers"; that packages of seed, plants, etc., are subject to the postage rate of one cent per ounce, and that the following articles are *absolutely excluded* from the mails, without regard to the amount of postage prepaid, or the manner in which they are wrapped, viz.:

All sealed packages, other than letters in their usual and ordinary form; *all* packages (except single volumes of printed books and packages of second-class matter), which weigh more than 4 pounds 6 ounces; Police Gazettes; publications which violate any copyright law of Canada.

UNITED STATES POSTAL AGENCY AT SHANGHAI, CHINA.—Articles addressed for delivery at the following places in China, viz.: Cheefoo (or Yenti), Chin Kiang, Chung King, Kaiping, Kalgan, Kiukiang, Nanking, Newchwang, Ningpo, Ourga, Peking, Hang Chow, Hankow, Ichang, Shanghai, Taku, Tientsin, Wenchow, Wuchang, Wuhu, are transmissible in the mails made up in San Francisco for the United States Postal Agency at Shanghai. See "Shanghai" in the Foreign Postage Table on page 20.

*Note* 1.

REGISTRATION.—All kinds of mail matter can he registered at the rate of eight cents for each package, in addition to the postage at regular rates, both postage and fee to be fully prepaid by stamps; all conditions as to marks, contents and method of securing packages being the same as described under the various classes (Notes A, D, E). Each package must bear name and address of sender, and a receipt will be returned from the person to whom addressed.

DOMESTIC MONEY ORDERS.

| | | | | | |
|---|---|---|---|---|---|
| For Orders not exceeding | $2.50 | | | | $0 03 |
| " exceeding | $2.50 | and not exceeding | | $5.00 | 05 |
| " " | 5.00 | " | " | 10.00 | 08 |
| " " | 10.00 | " | " | 20.00 | 10 |
| " " | 20.00 | " | " | 30.00 | 12 |
| " " | 30.00 | " | " | 40.00 | 15 |
| " " | 40.00 | " | " | 50.00 | 18 |
| " " | 50.00 | " | " | 60.00 | 20 |
| " " | 60.00 | " | " | 75.00 | 25 |
| " " | 75.00 | " | " | 100.00 | 30 |

(Postal Notes no longer issued.)

## INTERNATIONAL MONEY ORDERS.

The fees for International Money Orders are as follows:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| For sums not exceeding $10..... | $0 10 | | | Over $50 and not exceeding $60..... | $0 60 | | |
| Over $10 and not exceeding $20..... | 20 | | | " 60 " " 70..... | 70 | | |
| " 20 " " 30..... | 30 | | | " 70 " " 80..... | 80 | | |
| " 30 " " 40..... | 40 | | | " 80 " " 90..... | 90 | | |
| " 40 " " 50..... | 50 | | | " 90 " " 100..... | 1 00 | | |

The sender of a money order must state the particulars thereof upon a form furnished by the post-office.

A money order may be endorsed once only.

The person who presents a money order for payment must be identified if unknown to the postmaster, unless the remitter upon his application waives identification.

A domestic money order may be repaid within a year at the office of issue. The fee will not be refunded.

Duplicates of lost or invalid money orders are issued by the department free of charge upon application made through the issuing or paying postmaster by remitter, payee or indorsee.

The issue of money orders on credit is prohibited.

A money order may be paid to a second person by endorsement of payee, or upon a written order or power of attorney to be filed with the paying postmaster.

A duplicate cannot be obtained of a postal note lost or destroyed.

An invalid postal note, that is, one not paid within three months from the last day of month of issue, will be replaced at an extra charge of three cents, by a duplicate issued by the department, to be applied for through the postmaster at any money order office. The invalid note must accompany the application.

International money orders may be drawn for payment in the following countries and places:

### Order Should be Sent by Remitter to Payee.

Alexandria, Egypt, if drawn as a French order.
Algeria.
Amoy, China.
Bahama Islands.
Bermudas.
Beyroot, Turkey, if drawn as a French order.
British Bechuanaland, South Africa.
British Guiana.
Canada.
Canton, China.
Cape Colony, South Africa.
Constantinople, Turkey, if drawn as British or French.
Foochow, China.
France.
Great Britain and Ireland.
Hankow, China.
Hawaiian Islands.
Hoihow, China.
Hong Kong, China.
Jamaica.
Leeward Islands.
Newfoundland.
New South Wales.
New Zealand.
Ningpo, China.
Orange Free State, South Africa.
Panama.
Port Said, Egypt.
Queensland.
Salonica, Turkey, if drawn as a French order.
Shanghai, China.
Smyrna, Turkey, if drawn as a French order.
South Australia.
Swatow, China.
Tasmania
Transvaal, South Africa.
Tripoli, Africa.
Tobago, West Indies
Tunis, Africa.
Trinidad, West Indies.
Victoria, Australia.
Windward Islands.
Zanzibar, Africa, if drawn as a French order.

### Order May be Kept by Remitter as a Receipt.

Accra, Gold Coast, Africa.
Aden, Arabia.
Adrianople, Turkey.
Alexandria, Egypt, if drawn as a British order.
Archipelago of Banca, Dutch East Indies.
Archipelago of Billiton, Dutch East Indies.
Archipelago of Riouw, Dutch East Indies.
Assab, Africa.
Austria-Hungary.
Azores.
Bagdad, Turkey.
Banana, Congo Free State.
Bassorah, or Basra, Turkey.
Bathurst, Gambia, Africa.
Belgium.
Belize, British Honduras.
Beluchistan, Asia.
Bermuda.
Beyroot, Turkey, if drawn as British or Austrian.
Boma, Congo Free State.
Borneo.
Bosnia.
British Honduras.
Bulgaria.
Bunder Abbas or Gombroon, Persia.
Burmah, Asia.
Bushire, or Abu' Shehr, Persia.
Caipha (or Haifa), Turkey.
Cameroons, Cameroons, Africa.
Candia, Crete, Turkey.
Canea, Crete, Turkey.
Cape Coast Castle, Gold Coast, Africa.
Celebes.
Ceylon.
Constantinople, Turkey, if drawn as Austrian.
Cyprus.
Danish West Indies.
Dar es Salaam, Africa.
Denmark.
Durazzo, Turkey.
Egypt.
Falkland Islands.
Faroe Islands.
Gambia, Africa.
Germany.
Gibraltar.
Gold Coast Colony, Africa.
Guadur or Gwadel, Beluchistan.
Heligoland.
Herzegovina.
Iceland.
India, British.
Italy.
Jaffa, Turkey.
Japan.
Java.
Jask, Persia.
Jerusalem, Turkey.
Kerassunde, Turkey.
Kilwa, Africa.
Klein-Popo, or Little Popo, Togo, Africa.
Lagos, Africa.
Labuan, Borneo.
Lamu, Africa.
Lindi, East Africa.
Linga, or Lingor, Persia.
Little Popo, or Klein-Popo, Togo, Africa.
Lome, Togo, Africa.
Luxemburg, Grand Duchy.
Madeira Islands.
Madura, Dutch East Indies.
Malacca, Straits Settlements.
Malta.
Massowah, Africa
Matadi, Congo Free State
Mauritius.
Mitylene, Turkey.
Molucca Islands.
Mombasa, Africa.
Muscat, Arabia.
Natal, South Africa.
Netherlands.
North Borneo, Sandakan.
Norway.
Pangani, Africa.
Penang, Straits Settlements.
Portugal.
Previsa, Turkey.
Retimo, Crete.
Rhodes, Turkey.
Roumania.
Saadani, East Africa.
Saint Helena.
Salonica Turkey, if drawn as British or Austrian.
Salt Pond, Gold Coast.
Salvador, Central America.
Samsun, Turkey.
Sandakan, Borneo.
Sant Quaranta, Turkey.
Sarawak, Borneo.
Scio, Chios, Turkey.
Seychelle Islands.
Sierra Leone, Africa.
Singapore, Straits Settlements.
Smyrna, Turkey, if drawn as Austrian.
Straits Settlements.
Sweden.
Switzerland.
Tanga, Africa.
Tangier, Morocco.
Trehizond, Turkey.
Turk's Island, West Indies.
Valona, Turkey.
Victoria, Cameroons, Africa.
Western Australia.
Zanzibar, Africa, if drawn as a British order.

# RATES OF POSTAGE TO FOREIGN COUNTRIES.

## UNIVERSAL POSTAL UNION.

Treaty concluded at Vienna, Austria, July 4, 1891.

| | Cts. |
|---|---|
| Letters, per 15 grams or ½ ounce (prepayment optional, except to places marked *). | 5 |
| Postal Cards, each | 2 |
| Postal Cards, with paid reply, each | 4 |
| Commercial papers, { First 10 ounces or fraction thereof | 5 |
| Commercial papers, { Every additional 2 ounces | 1 |
| Samples of merchandise, { First 4 ounces | 2 |
| Samples of merchandise, { Every additional 2 ounces | 1 |
| Registration Fee on letters or other articles | 8 |

All correspondence other than letters must be prepaid at least partially.

†Correspondence paid to British Indian Frontier only.

INTERNATIONAL MONEY ORDERS are issued only to Countries or Places marked ¶.

COUNTRIES OR PLACES WHICH, WITH THE UNITED STATES, ARE COMPRISED IN THE UNIVERSAL POSTAL UNION, AND TO WHICH THE ABOVE RATES APPLY.

(*The Italics in brackets represent the Nationality of Foreign Possessions.*)

Abyssinia, East Africa.
Aden, Arabia, British P. O.
Africa (W. C.) Br. Colonies.
Africa (Fr. Port. & Sp. pos.)
Ajuda, Africa. (*Portuguese*)
Algeria, Africa. (*French.*)
Algiers, Africa. (*French.*)¶
Alhucemas, N. Africa. (*Sp.*)
Amar, Asia. (*Spanish.*)
Amirante Islands, E. Africa.
Amoy, Hong Kong P. O.
Andorra, Rep. of (*Spain.*)
Angola, Africa. (*Portug'se.*)
Annobon Isl'd., Africa. (*Sp.*)
Antigua, Isl'd. W.I. (*British*)
Aracan, British India.
Argentine Republic.
Aruba, S. America. (*Dutch.*)
Asia (Dch., Fr., Pr. & Sp. Col.)
Colon, U. S. of Colombia.
Assinie, Africa. (*French.*)
Austria-Hungary.¶
Azores Islands. (*Port.*)¶
Bahama Islands. (*British.*)
Bakel, Africa. (*French.*)
Balearic Isles. (*Spanish.*)
Bali, Asia. (*Dutch.*)
Banca, Asia. (*Dutch.*)
Barbadoes, W. I. (*British.*)¶
Barbary (Tunis & Tripoli.)
Batavia, Java, Asia. (*Dutch.*)
Bay Islands, Sp. Honduras.
Belgium.¶
Bermuda Islds., W. I. (*Br.*)
Bien-Hoa, Coch.-China. (*Fr*)
Billiton, Asia. (*Dutch.*)
Bissao, Africa. (*Portug'se.*)
Bogota, U.S. of Colombia.
Bolivia, South America.
Bonaire Islds., W.I. (*Dutch.*)
Borneo, Asia. (*Dutch.*)
Bourbon, Isld., Africa. (*Fr.*)
Brazil, South America.
Bulgaria, Principality of.
Burmah, British India.
Cabul, Afghan, *via* Italy.*†
Cacheo, Isld., Africa. (*Port*)
Cambodia, Fr. P. Offices in.
Cameroons (or Kameroun), West Africa.
Canary Islands. (*Spanish.*)
Canton, Hong Kong, P. O.
Cape Verde Is., Afr. (*Port.*)
Caroline Is., Oceanica. (*Sp.*)
Carthagena, U. S. Colombia.
Casablanca, Morocco. (*Sp.*)
Celebes, Asia. (*Dutch.*)
Ceuta, N. Africa. (*Spanish.*)
Ceylon. (*British.*)
Chaffarine Is., N. Afr. (*Sp.*)
Chandernagore, India. (*Fr.*)
Chili, South America.
China, *via* Russia.
China, *via* Hong Kong.
China, *via* France.
Cochin China (French Col.in)
Colombia (U.S. of) S. Amer.
Comino, Malta. (*British.*)
Cominotto, Malta. (*British.*)
Congo (State of) W. Africa.
Constantinople, Turkey.¶
Corisco Is., Africa. (*Sp.*)
Costa Rica, Cent'l America.
Cuba, W. I. (*Spanish.*)
Curacoa Is., W.I. (*Dutch.*)
Cyprus Island. (*British*)
Dagana, Senegal. (*French.*)
Damao, Asia. (*Portuguese.*)
Denmark.¶
Desirade Isld., W. I. (*Fr.*)
Diu, Asia. (*Portuguese.*)
Dominica Isld., W. I. (*Brit.*)
Dominica, Rep. of, W. I.
East Africa, Ger. Protectorate.
Ecuador, S. America.
Egypt, Africa.¶
Falkland Is., S. Amer. (*Br.*)
Faroe Islands, Denmark.
Fernando Po. Is., Afr., (*Sp.*)
Finland, Gr. Duchy, Russia.
Flores, Asia. (*Dutch.*)
Foo-chow, Hong Kong P. O.
Formosa, *via* Hong Kong.
France.¶
French Colonies, all.
Fusam-po, Corea, Jap. P.O.
Gaboon, Senegal. (*French.*)
Gambia, W. Africa. (*Br.*)
Gambier, Is., Oceanica. (*Fr.*)
Genzanshin, (Corea.) Japanese P. O. at.
Germany.¶
Gibraltar, Spain. (*British.*)
Goa, Asia. (*Portuguese.*)
Gold Coast, W. Africa. (*Br.*)
Goree, Senegal. (*French.*)
Gozzo, Malta. (*British.*)
Grand Bassam, W. Afr. (*Fr.*)
Great Britain.¶
Greece.
Greenland, N. America.
Grenada, Isld., W. I. (*Br.*)¶
Grenadines Is., W. I. (*Br.*)
Guadeloupe Is., W. I. (*Fr.*)
Guadur, British India.
Guatemala, Centr. America.
Guiana, Br., Fr. and Dutch.
Hankow, Hong Kong P. O.
Hawaii, Sandwich Islands.¶
Hayti, isld., W. I.
Hatien, Cochin China. (*Fr.*)
Heligoland Isld., Germany.
Hindostan, British India.
Hoihow, Hong Kong P. O.
Holkar, Br. Ind. *via* Italy.†
Honduras, Br. C. America.
Honduras, Rep. C. America.
Hong Kong, China.¶
Hungary.
Hyderabad, Ind., *via* Italy.*†
Iceland Isld., Denmark.
India, British.¶
India (French Est'blish'ts in)

## RATES OF POSTAGE TO FOREIGN COUNTRIES—*Continued.*

Ionian Isles, Greece.
Ireland.¶
Isle of Pines, Oceanica. (*Fr.*)
Italy.¶
Jamaica, Isld., W. I. (*Br.*)¶
Japan, Asia.¶
Java, Batavia, Asia (*Dutch*).
Jinsen (Corea), Jap. P. O. at
Kalgan, China, *via* Russia.
Kameroun.
Karakal, India. (*Fr.*)
Kashmir, Ind., *via* Italy.*†
Kiung-Chow, H'g K'g P. O.
Labrador.
Labuan, Philippine Isl. (*Br.*)
Ladakh, Thibet, *via* Italy.*
Ladrone Is., Oceanica (*Sp.*)
Lagos, W. Africa (*Br.*)
Larrache, Morocco. (*Span.*)
Les Saintes, Is., W. I. (*Fr.*)
Leeward Is., W. I. (*Br.*)
Liberia, Africa.
Lichtenstein, Princ. Austria.
Lombok, Asia. (*Dutch.*)
Low Islds., Oceanica. (*Fr.*)
Loyalty Is., Oceanica (*Fr.*)
Luxemburg (Gr. Duchy of).¶
Luzon, Philippine Is. (*Sp.*)
Macao Hong Kong P. O.
Macassar, Asia. (*Dutch.*)
Madagascar Isls., Afr. (Ste. Marie, Tamatave, Majunga and Ambositra, Andevorante, Fenerive, Fiaranantsoa, Foulpointe, Ivondro. Maevatanana, Mahambo, Mahanoro, Mahela, Maintirano, Mananjary, Morondava, Morotsangana, Nossi-Vé, Tananarive [also known as [Antananarivo, Vatomandry, Vohemar.
Madeira, Isld., Portugal.¶
Madura, Asia. (*Dutch.*)
Mahe, India. (*French.*)
Malacca Straits Sett's. (*Br.*)
Malta, Isld. (*British.*)
Mandalay, Br. Indian P. O.
Manila, Philippine Isls. (*Sp.*)
Mariana Is., Oceanica. (*Sp.*)
Marie Galante, Is., W. I. (*Fr.*)
Marquesas Is., Oce'ca. (*Fr.*)
Marshall Islands, Ger. Pro.
Martinique Is., W. I. (*Fr.*)
Massowah, R. Sea (It. P. O. at)
Mauritius Is., Africa. (*Br.*)
Mayotte, W. Africa. (*Fr.*)
Mazagan, Morocco. (*Span.*)
Melilla, N. Africa. (*Span.*)
Mindanao, Philip'ne Is. (*Sp.*)
Miquelon, Is , N. Am. (*Fr.*)
Mogador, Morocco (*Sp.*)
Moldavia, Roumania.
Moluccas, Asia. (*Dutch.*)
Monaco, Princip. of France.
Montenegro.
Montserrat, W. I. (*British.*)
Morocco, Fr. & Sp. P. O. in.
Mozambique, Africa. (*Port.*)
Muscat, British Indian P. O.
Mysore, Br. Ind., *via* Italy.†
Mytho, Cochin China. (*Fr.*)
Nassau, N. P. Bahamas. (*Br.*)
Natal, Africa, Brit. Col. of.
Navigators Islands. (Ger. P. O. at Apia.)
Netherlands.¶
Netherland Colonies in Asia, America and Oceanica.
Nevis, Isld., W. I. (*British.*)
New Caledonia, Ocean. (*Fr.*)
Newfoundland.
New Guinea, Oce'ca. (*Dutch.*)
New Guinea Company, Territory of, Ger. Pro.
New South Wales, including Lord Howe Island and Norfolk Island.
New Zealand, including Chatham Islands.
Nicaragua, Centr. America.
Ning-po, Hong Kong, P. O.
Norway.¶
Nossi be, W. Africa. (*Fr.*)
Nubia, Egypt.
Obock, East Coast of Africa (French P. O. at.)
Ourga, China, *via* Russia.
Palawan, Philip'ne Is. (*Sp.*)
Panama, U. S. of Colombia.
Panay, Philip'ne Isl. (*Sp.*)
Papua, Oceaniea. (*Dutch.*)
Paraguay, S. America.
Patagonia, S. America.
Pegu, British India.
Pekin, China, *via* Russia.
Penang, Straits Settlts. (*Br.*)
Penon de Gomera, N. Af. (*Sp.*)
Persia, Asia.
Persian Gulf, Br. Ind. P. O.
Peru.
Philippine Is., Ocea. (*Sp.*)
Pines, Isle of, Oceanica.
Pondicherry, India. (*Fr.*)
Porto Rico, W. I. (*Span.*)
Portugal.¶
Port. Col'o's, Asia & Africa.
Poulo-Condor, C. China. (*Fr.*)
Prince, Isld., Africa. (*Port.*)
Queensland.
Rabat, Morocco, Spa. P. O.
Reunion Isld., Africa. (*Fr.*)
Rhio-Riouw, Asia. (*Dutch.*)
Rodrigues Is., Africa. (*Br.*)
Roumania.
Russia.
Saba Islds., W. I. (*Dutch.*)
Saffi, Morocco, Span. P. O.
Saigon, Cochin China. (*Fr.*)
Salvador, Central America.
Samoan Islands (Ger. P. O. at Apia.)
Sandwich Islds., Oceanica.
San Domingo Republic, W. I.
San Marino Republic, Italy.
Senegal, W. Africa. (*Fr.*)
Senegambia, W. Africa. (*Br.*)
Servia.
Seychelles, Is., Africa. (*Br.*)
Shanghai (U. S. Postal Agency at.)
Shanghai, *via* Hong Kong.
Shanghai, *via* France.
Siam, Asia.
Sierra Leone, W. Af. (*Br.*)
Singapore, Asia. (*British.*)
Soudan, Egypt.
South Australia.
S. W. Africa, Ger. Pro.
Spain.
Spanish Colonies in Asia, Africa, America & Oce'ca.
St. Bartholomew, Is'ld, W. I. (*French.*)
St. Christopher I., W. I. (*Br.*)
St. Croix Isl., W. I. (*Dan.*)
St. Domingo, Republic, W. I.
St. Eustatius Is., W. I. (*Dut.*)
St. John Is., W. I. (*Dan.*)
St. Kitts Is., W. I. (*Br.*)
St. Lucia Is., W. I. (*Br.*)¶
St. Louis, W. Africa. (*Fr.*)
Ste. Marie Madagasc'r. (*Fr.*)
St. Martin, W. I. (*Fr.& Dut.*)
St. Pierre, W. I. (*French.*)
St. Thomas Is. W. I. (*Dan.*)
St. Thome Is., Afr. (*Port.*)
St. Vincent, W. I. (*Br.*)¶
Staten Island, S. America.
Straits Settlem'ts, Asia. (*Br.*)
Sumatra, Asia. (*Dutch.*)
Sumbawa, Asia. (*Dutch.*)
Surinam, S. America. (*Dut.*)
Swatow, Hong Kong P. O.
Sweden.¶
Switzerland.¶
Tahiti Isld., Oceanica. (*Fr.*)
Tamatave, Madagasc'r. (*Fr.*)
Tangier, F. & Span. P. O.
Tasmania.
Tenasserim, British India.
Terra del Fuego.
Tetuan, Morocco, Sp. P. O.
Tien-Tsin, China, *via* Russia.
Timor, Asia. (*Dut. & Port.*)
Tobago Isld., W. I. (*Br.*)¶
Togo, W. Africa, Ger. Pro.
Tonquin (French P. O. in.)
Toubouai, Oceanica. (*Fr.*)
Trinidad Isld., W. I. (*Br.*)
Tripoli (Italian P. O. at.)
Tschandok, Co. China. (*Fr.*)
Tuamotou, Oceanica. (*Fr.*)
Tunis, (Fr. and Italian P. O.)
Turkey—Europe and Asia.
Turk's Island, W. I. (*Br.*)
Uruguay, S. America.
Venezuela, S. America.
Victoria.
Vingh-Long, C. China. (*Fr.*)
Virgin Isles, W. I. (*British.*)
Wallachia, Roumania.
West Indies.
Western Australia.
Yanaon, India. (*French.*)
Zanzibar, Afr., *via* Aden.*

*Regarding exceptions, see Note H., p. 406.

## COUNTRIES IN UNIVERSAL POSTAL UNION WITH WHICH THE UNITED STATES HAS SPECIAL CONVENTIONS.

**Canada,** comprising Provinces of *British Columbia*, *Manitoba*, *New Brunswick*, *Nova Scotia*, *Ontario*, *Prince Edward Island*, *Quebec*, and *North West Territories*.....
**Mexico**.....

*Limit of letter weight* 30 gr. or 1 oz.; *postage-rates* on all classes of mail matter; the United States domestic rates; except seeds, plants, etc., for Canada, the rate upon which is 1 cent per oz.

## COUNTRIES OR PLACES NOT IN UNIVERSAL POSTAL UNION.

Prepayment is compulsory.
† The limit of payment is at port of debarkation; for all other places, to destination
‡ Samples are not accepted for these destinations.
§ Registration is allowed on letters and other articles. Fee, 10 cents.
‖ Registration is allowed *only* on letters. Fee, 10 cents.
¶ Money orders are issued at same rates as specified at top of page 381.
Postal cards cannot be sent from the United States to any of the following places *except* Canada.

| COUNTRIES OR PLACES OF DESTINATION. | Per 15 Grams, or ½ Ounce. | Newspapers. | | Other Printed Matter, Samples and "Commercial Papers." | |
|---|---|---|---|---|---|
| | | Limit for Single Rate. | Postage for Single Rate. | Limit of Weig | Postage for Single Rate. |
| | Cts. | Oz. | Cts. | Oz. | Cts |
| Africa, except Egypt, Liberia, Congo, the Transvaal, British, French, Spanish and Portuguese Colonies, the Territories of South-West Africa, and of Togo, Western Africa (German Protectorates), Tunis, and the European post-offices in Morocco, Abyssinia, and Madagascar, by British Mail.....† | 10 | 2 | 2 | 2 | |
| Ascension Island. S. Atlantic, British Mail... | 10 | 2 | 2 | 2 | |
| Basutoland, *see* Cape Colony. | | | | | |
| Bechuanaland, S. Africa. British Mail.....§ | 10 | no | 2 | 2 | 2 |
| Caffraria, *see* Cape Colony. | | | | | |
| Cape Colony, S. Africa, British Mail.....§¶ | 10 | 2 | 4 | 2 | 2 |
| China, British Mail, *via* Brindisi.....§ | 10 | 2 | 2 | 2 | 2 |
| Comoro Islands (except Mayotte) Mozambique Channel..... | 5 | no | 2 | 2 | 1 |
| Fiji Islands, *via* San Francisco and Sydney.....†‡ | 5 | no | 2 | 2 | 2 |
| Griqualand, *see* Cape Colony. | | | | | |
| Kimberly, *see* Cape Colony. | | | | | |
| Madagascar, except St. Marie, Tamatave, Majunga and Ambositra, Andevorante, Fenerive, Fiaranantsoa, Foulpointe, Ivondro, Maevatanana, Mahambo, Mahanoro, Mahela, Maintirano, Mananjary, Morondara, Nossi-Vé, Tananarive, Vatomandry, Vohemar, by British Mail.....† | 10 | 2 | 2 | 2 | 2 |
| Morocco, except Spanish Possessions on West Coast.....† | 10 | 2 | 2 | 2 | 2 |
| Navassa, West Indies, direct mail.....†‡ | 5 | no | 2 | 2 | 2 |
| Navigator's Islands, Pacific.....†‡ | 5 | no | 2 | 2 | 2 |
| Orange Free State, *see* Cape Colony. | | | | | |
| Pitcairn Island, Pacific (*no registration.*).....†‡ | 5 | no | 2 | 2 | 2 |
| St. Helena, South Atlantic, British Mail.....§ | 10 | 2 | 2 | 2 | 2 |
| Samoan Islands, *see* Navigator's Islands. | | | | | |
| Shanghai, direct, *via* San Francisco.....‡‖ | 5 | no | 2 | 2 | 2 |
| Transvaal, South Africa, British Mail.....§ | 10 | no | 2 | 2 | 2 |

# PARCELS POST.

STATEMENT SHOWING THE COUNTRIES TO WHICH PARCELS MAY BE SENT; THE DIMENSIONS, WEIGHT AND RATES OF POSTAGE APPLICABLE TO PARCELS, AND THE EXCHANGE POST OFFICES WHICH DISPATCH AND RECEIVE PARCELS POST MAILS.

| Names of Countries. | Allowable Weight of Parcels. | | | Postage. | | Exchange Post Offices. | |
|---|---|---|---|---|---|---|---|
| | Greatest Length. | Greatest Length and Girth Combined. | Greatest Girth. | Greatest Weight—Pounds. | For a Parcel not exceeding 1 Pound. | For every additional Pound or fraction of a Pound. | United States. | Foreign. |
| Bahamas | 3 feet 6 inches. | 6 feet. | ..... | 11 | 12 cts. | 12 cts. | New York. | Nassau. |
| Barbadoes | 3 " 6 " | 6 " | ..... | 11 | 12 " | 12 " | " | Bridgetown. |
| Colombia | 2 " | ..... | 4 feet. | 11 | 12 " | 12 " | All offices authorized to exchange mails between the two countries. | |
| Costa Rica | 2 " | ..... | 4 " | 11 | 12 " | 12 " | | |
| The Danish West Indies | 3 " 6 " | 6 feet. | ..... | 11 | 12 " | 12 " | | |
| The Hawaiian Kingdom | 3 " 6 " | 6 " | ..... | 11 | 12 " | 12 " | San Francisco. | Honolulu. |
| Honduras (British) | 3 " 6 " | 6 " | ..... | 11 | 12 " | 12 " | New Orleans. | Belize. |
| Jamaica | 3 " 6 " | 6 " | ..... | 11 | 12 " | 12 " | New York. | Kingston. |
| Leeward Islands | 3 " 6 " | 6 " | ..... | 11 | 12 " | 12 " | " | St. John, Antigua. |
| Mexico | 2 " | ..... | 4 feet. | 11 | 12 " | 12 " | All offices authorized to exchange mails between the two countries. | |
| Salvador | 3 " 6 " | 6 feet. | ..... | 11 | 12 " | 12 " | | |
| Guiana (British) | 3 " 6 " | 6 " | ..... | 11 | 12 " | 12 " | | |
| Windward Islands | 3 " 6 " | 6 " | ..... | 11 | 12 " | 12 " | | |
| Newfoundland | 3 " 6 " | 6 " | ..... | 11 | 12 " | 12 " | New York, Philadelphia. | St. John's, N. F. |

# AMERICAN PHOTOGRAPHIC SOCIETIES.

AGASSIZ ASSOCIATION, PHOTOGRAPHIC SECTION OF THE MANHATTAN CHAPTER.—Organized 1890. *President*, C. F. Groth; *Vice-President*, Ch. Kromm; *Board of Trustees*, C. F. Groth, E. B. Miller, W. G. Miller, H. T. Rowley, J. Breunich, E. Staubrandt,. F Kromm, Miss M. Hargrove, Miss M. Miller; *Treasurer*. Wm. S. Miller; *Librarian*, Miss K. Hargrove; *Cor. Secretary*, Ed. B. Miller, 141 East 40th Street. New York. Place of meeting, 141 East 40th Street. Ordinary meetings, once each month as announced. Special meetings when called. Annual meeting, January. Membership September 1: Honorary, 2; active, 34; total. 36. Exhibitions as announced.

AKRON CAMERA CLUB.—Akron, Ohio. Organized November 10, 1890. *President*, Ed. A. Terrass, *Vice-President*, Henry Canfield; *Executive Committee*, Prof. Charles Knight, Prof. Wm. D. Shipman, Henry Canfield; *Treasurer*, F. H. Adams; *Secretary*, Margaret Mitchell, 150 South Summit Street. Akron, Ohio. Place of meeting, homes of members Ordinary meetings. second Tuesday of the month, 7.30 P.M. Special meetings at discretion of the President. Annual meeting, first or second week in June. Membership September 1: Active. 15. Publications; the minutes are published in daily paper day after the meetings. Exhibitions: private exhibitions once a month; public exhibitions at the discretion of the Executive Committee. The Club is doing very active work—are having outings every two weeks.

ALBANY CAMERA CLUB.—72 Chapel Street, Albany, N. Y. Organized October 21 1887. *President*, W. W. Byington; *Vice-President*, Dayton Ball: *Treasurer*. Edward D. Mix; *Librarian*, Chas. B. Tillinghast; *Directors*, J. S. Paterson, Chas. S. Pease, J. S. Van Buren, Prof. Maurice Perkins, Karl J. Phisterer, T. C. Leutze. Dr. S. B. Ward, Dr. T. S. Carroll. *Secretary*, Dr. Chas. E. Davis, 91½ Hudson Avenue, Albany, N. Y. Place of meeting, 72 Chapel Street. Ordinary meetings, first Friday evening in each month. Special meetings on call. Annual meeting. first Friday in April. Membership September 1: Honorary, 2; aetive, 65; associates, 110; non-resident, 10; total, 185. Exhibitions: at least two lantern-slide exhibitions each month during winter, and an annual print exhibition, at Club rooms, some time during winter or spring.

ALLENTOWN Y. M. C. A. CAMERA CLUB.—Allentown, Penn. Organized 1895, *President*, Arnold R. Lewis; *Vice-President*, Chas. H. Rochel; *Treasurer*, A. K. Krauss; *Secretary*, J. K. Bowen; *Instructor*, Rev. S. U. Mitman.

AMATEUR PHOTOGRAPHIC ASSOCIATION.—Selma, Ala.—formerly the Y. M. C. A. Camera Club. Organized December 29, 1887. *President*, William S. Monk; *Executive Committee*, S. A. Sexton; *Librarian*, Miss Mary E. Keipp; *Secretary*, S. Orlando Trippe, Selma, Dallas Co., Alabama. Ordinary meetings, first Thursday in each month. Special meetings at call of President. Annual meeting, first Thursday in January. Membership September 1: Honorary, 18; active, 18; total, 18. Exhibitions: none yet—expect soon, or at an early date, to take up lantern slides.

AMERICAN INSTITUTE. PHOTOGRAPHIC SECTION OF.—Organized March 26, 1959. *President*, Henry J. Newton; *Vice-President*, Cornelius Van Brunt; *Executive Committee*, Officers of the Section; *Treasurer*, William Dean; *Librarian*, George Whitfield, r.; *Secretary*, Oscar G. Mason, Photographic Department, Bellevue Hospital, New York City. Place of meeting, Institute Hall, 111–115 West 38th Street, Ordinary meetings, first Tuesday of each month, except July and August, at 8 o'clock P.M. Special meetings, upon call of officers. Annual meeting, first Thursday in February. Membership September 1: about 1,800. Exhibitions at monthly meetings.

AMERICAN LANTERN SLIDE INTERCHANGE.—Organized 1885. Re-organized February, 1888. Incorporated under laws of New York State November 18, 1893. The Board of Managers meet annually in New York the last of November for the testing of lantern slides submitted by the contributing associations. The season commences December 1 each year, and ends November 15 the following year, during which time interchanges of lantern slides are made monthly between the associations, there being, however, no circulation of slides during the months of July and August. Interchanges of lantern slides are also made annually with foreign societies.

For the year 1895 the following associations are members:—Albany Camera Club, Albany, N. Y.; Bethlehem Photographic Society, Bethlehem, Penn.; Buffalo Camera Club, Buffalo, N. Y.; California Camera Club, San Francisco. Cal.; Chicago Society of Amateur Photographers, Chicago, Ill.; Columbia Camera Club, Astoria, Ore.,

Detroit Lantern Slide Club, Detroit, Mich.; Elizabeth Camera Club, Elizabeth, N. J.; Frankford Camera Club, Frankford, N. J. Harvard Camera Club, Cambridge, Mass.; Memphis Camera Club, Memphis, Tenn.; Minneapolis Camera Club, Minneapolis, Minn. Newark Camera Club, Newark, N. J.; New Orleans Camera Club, New Orleans La. Orange Camera Club, Orange, N. J.; Photographic Club of Baltimore City, Md.; Photographic Society of Philadelphia, Pa.; Portland Camera Club, Portland, Me.; Providence Camera Club, Providence, R. I.; St. Louis Camera Club, St. Louis, Mo., Schuylkill Camera Club, Pottsville, Pa.; Society of Amateur Photographers, New York City; Syracuse Camera Club, Syracuse, N. Y.; Toronto Camera Club, Toronto, Canada.

*Board of Managers*, F. C Beach, 361 Broadway, New York City (*General Manager*)· William H. Rau. 1324 Chestnut Street, Philadelphia, Pa , Will H. Olmstead, Syracuse, N. Y.; Harry W. Smith, Newark, N. J.; H. H. Boyce, Buffalo, N. Y.

The Interchange carries on an international interchange in the fall and winter of each year, with the Lantern Society of London, the Photographic Society of the North of France, Photographic Society of Japan, and the *Photography* prize slides. Each club is represented by a Lantern Slide Director—annually elected prior to October of each year. In October the Lantern Slide Directors cast a mail vote for a Board of five Managers, who hold office from November 1 ot the following November, and manage the affairs of the interchanges. Clubs wishing to enjoy the advantages of the Interchange must submit a set of fifty slides and pay an entrance fee of $10 to the General Manager.

AMERICA, PHOTOGRAPHIC ASSOCIATION OF—*President*, R. P. Bellsmith; *1st Vice-President*, Geo. Steckel; *2d Vice-President*, W J. Root; *Treasurer*, G. M. Hayes; *Secretary*, J. Will. Kelmer. Annual Convention in 1896 at Chautauqua.

AMERICAN LEAGUE OF AMATEUR PHOTOGRAPHERS.—Organized, New York, July 12, 1892. *President*, Paul L. V Thiery; *Vice-President*, Dr George L. Parmele of Hartford, Miss Francis B. Johnston of Washington, D. C. *Executive Committee*, Paul L. V. Thiery, Dr. George L. Parmele, Miss F. B. Johnston, W. S. Drew, R. M. Fuller, T. J Burton, Dr. James H. Stebbins, Jr., H. S. Fowler, O. S. Teale, C. G. Hine; *Treasurer*, W. H. Drew, Lynn, Mass.; *National Delegate*, R M. Fuller, Cranford, N. J.; *Secretary*, T. J. Burton, 113 West 38th Street. Place of meeting, 113 West 38th Street, New York. Annual meeting, second Tuesday in May. Membership September 1: active, 1253; total, 1253. Publication, *The Developer*, monthly.

Officers of the New York Division: *President*, James H. Stebbins, Jr., Society of Amateur Photographers, New York; *First Vice-President*, Dr. Ely Van De Warker, Syracuse Camera Club; *Second Vice-President*, Frank La Manna, Brooklyn Academy of Photography, *Secretary-Treasurer*, H. S. Fowler, Brooklyn Academy of Photography.

Officers of the New Jersey Division: *President*, Oscar S. Teale. President of the Plainfield Camera Club; *First Vice-President*, William A. Halsey, of Newark Camera Club; *Second Vice-President*, A. J. Thomas, President Hoboken Camera Club; *Secretary-Treasurer*, R. M. Fuller,

BALTIMORE CITY, THE PHOTOGRAPHIC CLUB OF.—Baltimore, Md., corner Madison and Eutaw Streets. Organized, 1891. *President*, A. S. Murray; *Vice-President*, Dr. Frank Slothower; *Directors*, A. S. Murray, Dr. Frank Slothower, A. J. Godby, F. W. McAllister, E. M. Barker, B. G. Buck, Charles E. Needles; *Treasurer*, E M. Barker; *Secretary*, Charles E. Needles, 404 Cathedral Street, Baltimore, Md. Place of meeting, 703 Madison Avenue, corner Madison and Eutaw Streets. Ordinary meetings, first Tuesday of the month, 8 P.M., club members, every Tuesday night. Annual Meetings, first Tuesday in April 8 P.M. Membership September 1: Honarary, 1; active, 39; corresponding, 21; associate, 36; total, 78. Exhibitions usually monthly at Club rooms.

BETHLEHEM PHOTOGRAPHIC SOCIETY OF BETHLEHEM, PA.—Organized January 16, 1895. *President*, Prof. E. M. Hyde; *Vice-President*, Prof. H. S. Housekeeper. *Executive Committee*, E. M. Hyde, H. S. Housekeeper, C. F. Smith, E. A. Rau, and F. E. Hammann; *Treasurer*, C. F. Smith. *Director of Lantern Interchange*, E. A. Rau, *Secretary*, F. E. Hammann. Place of meeting, at homes of members. Ordinary meetings, third Tuesday in every month at 8 P.M., except July and August Annual meeting, third Tuesday in January. Membership September 1: Honorary, 10; active, 15; total, 25. Exhibitions at frequent intivals; no definite date.

BOSTON CAMERA CLUB.—50 Bromfield Street, Boston, Mass. Organized 1881. *President*, George M. Morgan; *Vice-Presidents*, William Sumner Briggs, J. Prince Loud, Charles Sprague; *Executive Committee*, George M. Morgan, William Sumner Briggs, J. Prince Loud, Charles Sprague, Wilbur C. Brown, Owen A. Eames, Albert E. Fowler, David W Lewis, James Meanes, Francis H. Manning, Ernest O. Cockayne. Charles H. Currier, Frederick S. Anable; *Treasurer*, Owen A. Eames; *Librarian*, Albert E. Fowler; *Secretary*, Charles Hall Perry. Place of meeting, Club rooms, 50 Bromfield Street. Ordinary meetings, 8 P.M., of the first

Monday in each month, except July, August and September. Special meetings as called. Annual meeting is the regular meeting in Jauuary. Membership September 1: Honorary, 8; active, 102; associate, 12; total, 122. Exhibitions are held in the galleries every month. The annual exhibition of the work of members was held this year in April.

BRIDGETON CAMERA SOCIETY.—46 and 48 E. Commerce Street, Bridgeton, N. J. Organized, 1870. *President*, Henry A. Janvier; *Vice-President*, George Hampton; *Executive Committee*, Hugh L. Reeves, Sydney E. Bowen, Howard W. Zithian; *Treasurer*, Sydney E. Bowen; *Secretary*, Oscar F Anderson, Bridgeton, N. J'; *Corresponding Secretary*, Henry W. Scull, Bridgeton, N. J., care of Cumb. Nat'l Bank. Ordinary meetings. first Tuesday in each month 8 P.M. Special meetings, on call from President. Annual meeting, first Tuesday in month of February. Membership September 1: Active, 40. Annual exhibitions each February.

BROCKTON CAMERA CLUB.—Brockton, Mass. Organized 1894. *President*, E. L. Brown; *Vice-President*, R. E Brayton; *Treasurer*, S. N. Eaton; *Secretary*, A. L. Evans, P. O. Box 211, Brocton, Mass. Place of meeting, Room No. 8, Smith Building. Ordinary meetings, third Friday in each month, 8 P.M. Annual meeting, third Friday in April.

BROOKLYN ACADEMY OF PHOTOGRAPHY.—Brooklyn, N. Y. Organized 1887. *President*, John Merritt, M.D.; *Vice-Presidents*, F. Dana Reed, Starks W. Lewis; *Treasurer*, W. J. Wintingham; *Librarian and Curator*, Wm. Arnold; *Recording Secretary*, A. A. Goubert; *Corresponding Secretary*, Geo. L. Colt, 9 Garden Place, Brooklyn, N. Y. Place of meeting, 177 Montague Street. Brooklyn, N. Y. Ordinary meetings. first Monday in each month, 8 P.M. Special meetings at call of President. Annual meeting, first Monday in February. Membership September 1: Honorary, 6; active. 89; corresponding, 15; total, 110. Exhibitions: Lantern exhibitions from November to May. Print exhibitions in May.

BROOKLYN INSTITUTE, DEPARTMENT OF PHOTOGRAPHY OF THE.—Organized 1889. *President*. W. H. Cooper; *Vice-President*, Mrs. C. N. Burdett; *Secretary*, Gould W. Hart. 849 Monroe Street, Brooklyn, N. Y. Place of meeting, 201 Montague Street. Ordinary meetings, every Thursday, 8 P.M. Special meetings, one each month. Annual meeting in May. Membership September 1: 275.

BROOKLYN Y. M. C. A. CAMERA CLUB.—Brooklyn, N. Y. Organized, 188 . *President*, W. H. Lowery; *Vice-President*, F. F. Braillard, Jr.; *Treasurer*, E. A. Crowell; *Secretary*, B. A. Barger, 160 Atlantic Street, Brooklyn, N. Y. Place of meeting, 205 Fulton Street. Ordinary meetings, second and fourth Thursdays of each month. Annual meetings, second Thursday in January. Membership September 1; 35.

BUFFALO CAMERA CLUB.—Buffalo, Erie County, N. Y. Organized 1889. *President*, George J. Bailey; *Vice-President*, Oscar H. Hauenstein; *Directors*, George J. Bailey. Oscar H. Hauenstein, William J. Haskell, Dr. G. Hunter Bartlett, Dr. Bernard Bartow-Harlow, H. Boyce. John A. Stein, Conrad L. Baer. Edward C. Hawks; *Secretary and Treasurer*, William J. Haskell, 871 Prospect Avenue, Buffalo, N. Y.. Place of meeting, Market Arcade. Ordinary meetings, first and third Fridays of each month. Special meetings upon call of President. Annual meeting, November 9th. Membership September 1: Active, 50: associate, 35; total 85.

CALIFORNIA CAMERA CLUB.—819 Market Street, San Francisco, California. Organized April 5, 1890. *President*. A. G. McFarland; *First Vice-President*, A. A. Martin; *Second Vice-President*, H. C. Tibbitts; *Board of Directors*, A. G. McFarland, A. A. Martin, H. C. Tibbitts, C. F. Cormack, E. G. Eisen, H. C. Owens, C. S. Close, I. E. Thayer, W. B. Webster, W. E. Goodrun, E. J. Mott; *Treasurer*, E. G Eisen; *Librarian*, H. C. Owens; *Corresponding Secretary*, C. S. Close; *Secretary*, C. F. Cormack, 819 Market Street, San Francisco, California. Place of meeting, 819 Market Street, Room 58. Ordinary meetings, first Tuesday after first day of month, except in case of holidays when it is held the following Tuesday at 8 P.M. Special meetings, at call of President, or majority of the Board of Directors, or the members expressed in writing. Annual meeting, first Tuesday in April, 8 P.M. Membership September 1: Honorary, 4; active, 147; associate, 17; subscribing, 183. total, 351. Exhibitions: Monthly illustrated lectures at Metropolitan Temple. Annual pay exhibition of lantern slides. Annual print exhibition. Twelve to fourteen exhibitions of interchange slides at Club rooms per year. Demonstrations of different branches of photography held twice a month on Wednesday evenings about nine months of year.

"CAMERADS."—New Brunswick, N. J. *President*, Prof. P. T. Austin, Ph.D.; *Secretary*, Dr. H Iredell, Lock Box 34, New Brunswick, N. J. Place of meeting, Rutger's College.

CANADA, PHOTOGRAPHIC ASSOCIATION OF.—Organized 1883. *President*, A. M. Cunningham, Hamilton, Ont.; *Vice-President*, F. Cooper, London; J. Fraser Bryce, Toronto; W. F. Johnson, Picton; *Executive Committee*, Officers; *Secretary-Treasurer*, E. Poole, St. Catharines, Ont. Place of meeting, Toronto. Annual meeting, November first and second. Membership September 1: Honorary, few. Exhibitions, October 31, November 1 and 2, at Toronto.

CAPITOL BICYCLE CLUB, CAMERA CLUB OF THE.—409 15th Street, N. W. Washington, D. C. Organized October, 1890. *President*, Daniel J. Carr; *Secretary-Treasurer*, Alfred J. Henry, Weather Bureau, Washington, D. C. Place of meeting, 409 15th Street. Ordinary meetings, first and third Thursdays each month. Exhibitions: Mid-winter lantern slide exhibition, and wall exhibition of prints in the spring or fall.

CAPITAL CAMERA CLUB.—Washington, D. C. *President*, José M. Yznaga; *Vice-President*, E. S. Ferguson; *Directors*, C. E. Fairman. R. Reyburn, M.D., W. P. Herbert; *Treasurer*, C. L. Du Bois; *Secretary*, F. B. Dante, 1305 T Street, N.W., Washington, D. C. Place of meeting, 401 Seventh Street, N.W. Ordinary meetings, first and third Saturdays in the month. Annual meeting, first meeting in May. Membership September 1: Honorary, 3; active, 38; total, 41. Exhibition in May.

CHAUAUTQUA PHOTOGRAPHIC EXCHANGE CLUB.—From New York to California. *President*. J. C. Carpenter, Home City, Ohio; *Treasurer and Secretary*, Mrs. C. L. Pierce, "Elmhurst," Riverside, Conn. Annual meeting, Chautauqua. Membership September, 14. We exchange unmounted photographs four times a year, and criticise each other's picture.

CHICAGO CAMERA CLUB.—Chicago, Ill. Organized 1889. *President*, Rev. M. L. Williston; *Vice-President*. Dr. M. R. Brown; *Treasurer*, E. J. Fowler; *Secretary*, W. W. Abbott, 182 Wabash Avenue, City. Place of meeting, 184 Wabash Avenue. Ordinary meetings, second Tuesday in each month, at 8 P.M. Annual meeting in April. Membership September 1: 65.

CHICAGO SOCIETY OF AMATEUR PHOTOGRAPHERS.—Chicago, Ill. Organized 1886. Re-organized 1894. *President*, W. A. Morse; *Treasurer*, M. Waite; *Secretary*, F. F. Gaylord, 597 Cleveland Avenue, Chicago, Ill. Place of meeting, 4 East Monroe Street. Ordinary meetings, second and fourth Thursdays in each month. Annual meeting, the first January meeting. Membership September 1: Honorary, 2; active, 38; total, 40.

CINCINNATI SOCIETY OF NATURAL HISTORY, PHOTOGRAPHIC SECTION.—Organized 1884. *President*, H. J. Buntin; *Vice-President*, T. H. Kelly; *Treasurer*, F. M. Coppeck; *Librarian*, Dr. A. I. Carsen; *Secretary*, J. M. Kay, 108 W. Fourth Street, Cincinnati, Ohio. Place of meeting, 108 Broadway. Ordinary meetings, second and fourth Monday evenings of each month. Annual meeting, first Monday of April. Membership September 1: Honorary, 1; active, 100; total, 101.

CLEVELAND CAMERA CLUB.—Cleveland, Ohio. Organized 1887. *President*, F. Dorn; *Vice-President*, A. Ogier; *Treasurer*, W. Dorn; *Secretary*, Dr. R. Dayton, 1202 Wilson Avenue, Cleveland, Ohio. Place of meeting, 5 Euclid Avenue. Ordinary meetings, first and third Tuesdays. Annual meeting in January. Membership September 1: 40.

COLORADO CAMERA CLUB.—Denver, Colorado. Organized 1892. *President*, W. H. Jackson; *Vice-President*, F. W. Hart; *Secretary*, E. L. Kern, P. O. Box 333, Denver, Colo. Place of meeting, Williamson Block, 16th Street. Ordinary meetings, first and third Tuesdays. Membership September 1: 38.

COLUMBIAN AMATEUR PHOTO EXCHANGE.—Have no permanent location, as members are scattered out pretty well, and living great distances apart. Organized March 1, 1893. *President*, J. T. Harden, Liberty, Nebraska; *Treasurer and Secretary*, A. H. Waite, Tacoma, Wash., 908 S. 9th Street. Membership September 1: 12. Established for interchange of ideas, discussion of photographic processes, and for quarterly exchange of prints, using as a basis of exchange, one 8x10 print, each member doing all the work himself. Have printed constitution and by-laws.

COLUMBIA CAMERA CLUB.—Astoria, Oregon. *President*, Wm. A. Sherman; *Vice-President*, Nelson Froyer; *Directors*, W. A. Sherman, G. W. Lonnsberry, Nelson Froyer, James Macomber, Wm. Timson; *Treasurer*, Wm. W. Lonnsberry; *Secretary*, Wm. Timson, 598 Commercial Street, Astoria, Oregon. Place of meeting, Engine Company's Hall: Ordinary meetings, second Wednesday of each month. Special meetings at call of President. Annual meeting, second Wednesday in November. Membership September 1: Honorary, 1; active, 15; associate, 10; total, 26.

COLUMBIA PHOTOGRAPHIC SOCIETY.—1507 Columbia Avenue, Philadelphia, Pa. Organized December 7, 1889. Incorporated July 3, 1894. *President*, Dr. G. J. R. Miller; *Vice-President*, W. P. Buchanan; *Board of Directors*, Benj. L. Beny, H. E. Havens, Rudolph Pott, John P. Kolb, Dr. G. J. R. Miller, John N. Reeve, W. P. Buchanan; *Secretary and Treasurer*, John N. Reeve. 203 Walnut Place, Philadelphia, Pa. Place of meeting, 1507 Columbia Avenue. Ordinary meetings, monthly, first Monday, at 8 P.M. Board meets first and third Mondays. Meetings for Demonstrations, every Monday, except in the summer time (July and August). Annual meeting, first Monday in February. Membership September 1: Honorary, 3; active, 42; corresponding, 1; total, 46. Exhibitions, every spring.

COLUMBUS CAMERA CLUB.—Y. M. C. A. Building, Columbus, Ohio. Organized October 6, 1884. Incorporated February, 1891. *President*, John Field; *Vice-President*, C. H. Doty; *Directors*, John Field, C. H. Doty, W. B. Kimball, C. S. Bradley, Hester C. Getz, P. P. Smythe, S. C. Bradford, J. J. Jennings, F. H. Howe. *Treasurer*, C. S. Bradley; *Librarian*, Hester C. Getz; *Secretary*, W. B. Kimball, No. 32 East Spring Street, Columbus, O. Place of meeting, Columbus Camera Club. Y. M. C. A. Building. Ordinary meetings, third Thursday of each month. Special meetings, subject to the call of the President. Annual meeting, third Thursday in December. Membership September 1: Honorary, 4; active, 60; total, 64. Annual outing, May 30.

CORTLAND CAMERA CLUB OF CORTLAND CO.—Cortland, N. Y. Organized Jan. 23, 1895. *President*, Dr. F. W. Higgins; *Vice-President*, J. G. Jarvis; *Treasurer*, L. M. Alexander; *Secretary*, L. M. Alexander, Lock Box 223, Cortland, N. Y. Place of meeting, Y. M. C. A. Parlors. Ordinary meetings, the first Wednesday evening of each month at 8 o'clock. Membership September 1: Active, 17. Exhibitions: at the November meeting the club to hold an annual exhibition of pictures. The club is a branch of the Y. M. C. A., use their rooms, and to have dark-room fitted up soon.

DELAWARE CAMERA CLUB.—Wilmington, Del. Organized December 5, 1891. *President*, John M. Rogers; *Vice-President*, 1st, Miss Rachel S. Howland; 2d, George A. Elliott; *Executive Committee*, Albert C. Griggs, Ernest B. MacNair, William H. Savery; *Treasurer*, Caleb M. Sheward; *Recording Secretary*, Willard C. Jackson; *Corresponding Secretary*, John C. Philips, 803 Franklin Street, Wilmington, Del. Place of meeting, Club Rooms, Equitable Building. Ordinary Meetings, first Thursday in each month at 8 o'clock P.M Special meetings, at the call of the President. Annual meeting, first Thursday in January, 8 P.M. Membership September 1: Active, 52; corresponding, 4; total, 56.

DETROIT LANTERN CLUB.—Detroit, Mich. Organized Jan. 6, 1891. *President*, Frank E. Kirby; *Director*, Alfred Noble, Jr.; *Treasurer and Secretary*, D. Farrand Henry, 52 Woodward Avenue. Place of meeting, Art Museum, Ordinary meetings, second Monday in each month. Annual meeting, January 6. Membership September 1: 22. Exhibitions: lantern exhibition about twice a month through the season.

ELIZABETH CAMERA CLUB.—96 Broad Street, Elizabeth, N. J. Organized May 2, 1893. *President*, D. R. Blackford; *Vice-President*, Jas. A. Woodward; *Executive Committee*, Jas. A. Woodward, V. T. L. Meyer, Dr. E. D. Frost, Jas. A. Knowles, J. G. Green, T. F. McCarty, A. P. Campbell; *Treasurer*, James A. Knowles; *Secretary*, Victor T. L. Meyer, 96 Broad Street, Elizabeth, N. J. Place of meeting, 96 Broad Street. Ordinary meetings, first and third Tuesdays of each month. Annual meeting, first Tuesday in May. Membership September 1: Honorary, 5; active, 25; associate, 2; total, 32. Exhibitions are given every two weeks, from November to April, with the interchange slides, and also local slides; admission by invitation only.

FRANKFORD CAMERA CLUB.—Main and Unity Streets, Frankford, Philadelphia. Organized October, 1889. *President*, J. Howard Morrison; *Vice-President*, Rich. B. Watmough; *Executive Committee*, Benj. S. Thorp, Robert T. Taylor, Rembrandt P. Summers, Miss M. C. Shallcross, Mrs. E. B. G. Justice; *Treasurer*, J. Howard Horrocks; *Secretary*, John M. Justice. 5016 Penn Street, Frankford, Philadelphia, Place of meeting, Wright's Institute, Main and Unity Streets. Ordinary meetings, second Friday of each month, 8 P.M. Conversational meetings, fourth Friday of each month, 8 P.M. Annual meeting, second Friday in April. Membership September 1: Honorary, 3; active, 81; corresponding, 3; total, 87. Exhibitions: annual exhibition held early in April each year. Visitors welcome at all meetings, and the club rooms open to strangers who may desire to use them.

HAMILTON ASSOCIATION CAMERA CLUB.—Hamilton, Ont. Organized 1892. *President*, J. R. Moodie; *Vice-President*, J. M. Eastwood; *Executive Committee*, J. W. Grant, A. H. Baker and officers; *Treasurer and Secretary*, W. White, 9 James Street, Hamilton, Ont. Place of meeting, Hamilton Association, Main Street. Ordinary meetings, last Tuesdays of each month. Membership September 1: 33.

HARVARD CAMERA CLUB.—Harvard University, Cambridge, Mass. Organized 1889. *President*, P. P. Sharples; *Vice-President*, C. P. M. Rumford; *Executive Committee*, F. A. Burlinghame, F. H. Cummings; *Treasurer and Secretary*, Haven Emerson, Thayer 33, Cambridge, Mass. Place of meeting, Harvard University.

HOBOKEN CAMERA CLUB.—Hoboken, N. J. Organized 1889. *President*, A. J. Thomas; *Vice-President*, C. Ludhaus; *Treasurer*, H. J. Kaltenbach; *Secretary*, A. L. Smith, 1045 Bloomfield Street, Hoboken, N. J. Place of meeting, Camera Building, 1036 Park Avenue. Ordinary meetings, first Tuesday of each month. Annual meeting in March. Membership September 1: 25. Exhibitions every month during the season.

INTERNATIONAL PHOTO. PRINT EXCHANGE.—Bluff Beach, Mass. Organized May, 1893. A postal Photographic Society, 23 members, residing in various countries, who exchange prints with each other by direct communication. *Secretary*, Walter Sprange, Beach Bluff, Mass. No meetings.

KEARNEY KAMERA KLUB.—Kearney, Neb. Organized October, 1894. *President*, J. T. Morey; *Vice-President*, Miss H. E. James; *Executive Committee*, R. M. Brockman, A. Snare, Miss L. A. Piper; *Treasurer*, Miss A. E. Knight; *Librarian*, H. E. Knight; *Secretary*, M. A. Hoover, M.D. Place of meeting, Kearney Public School. Ordinary meetings, first and third Saturdays of each month.

LANCASTER CAMERA CLUB.—Lancaster, Pa. Organized May 3, 1895. *President*, W. S. Gleim; *Vice-President*, F. A. Demuth; *Treasurer, Librarian and Secretary*, G. H. Werntz, 116 North Queen Street, Lancaster, Pa. Place of meeting, home of President. Ordinary meetings, first Friday of each month, 8 o'clock P.M. Special meetings at call of President. Annual meeting in May. Membership September 1: 11. Exhibitions: Print and lantern slides in spring.

LAWRENCE CAMERA CLUB.—Lawrence, Mass. Organized April, 1893. *President*, John Lord; *Vice-Presidents*, John H. Greer and Caleb Saunders; *Directors*, Miss Mabel Noyes, E. Braithwaite, G. C. Cannon *Treasurer*, Carl H. Graf; *Librarian*, Miss Carrie J. Pingree; *Secretary*, Richard A. Hale, Lawrence, Mass. Place of meeting, Central Block. Ordinary meetings, first Thursday in each month at 8 P.M. Annual meeting, first Thursday in April. Exhibitions usually in November.

LOWELL CAMERA CLUB.—Lowell, Mass. Organized January, 1889. Incorporated March, 1892. *President*, Paul Butler; *Vice-Presidents*, William P. Atwood, F. T. Walsh; *Directors*, Arthur Staples, Charles Ruwels, Fay H. Martin; *Treasurer*, M. A. Taylor; *Librarian*, A. H. Sanborn; *Secretary*, George A. Nelson, 91 Mansur Street, Lowell, Mass. Place of meeting, Central Block. Ordinary meetings, by special notice. Annual meeting, first Tuesday in March. Membership September 1: 21.

MATTAPAN CAMERA CLUB.—Mattapan, Mass. Organized 1890. *President*, John A. Locklin; *Vice-President*, Walter Hertzberg; *Treasurer*, Alfred E. Karcher; *Librarian and Secretary*, Erdmann Sonnenbrodt; address, P. O. Box 83, Mattapan, Mass.; residence, Brush Hill Road, Milton, Mass. Place of meeting, at private residence of members. Ordinary meetings, every Sunday at residence of the Secretary. Special meetings, time and place designated by President. Annual meeting, first Sunday in May. Membership September 1: Active, 8; total 8. Exhibitions: free lantern slide exhibitions to schools and churches by invitation, also to friends of members of the club.

MEMPHIS CAMERA CLUB.—38 Madison Street, Memphis, Tenn. Organized April 1, 1893. *President*, Sam. J. Latta; *Vice-President*, A. Wardle; *Board of Directors*, S. J. Latta, A. Wardle, George O. Friedel, Matt. Stewart, E. I. Pinnel; *Treasurer and Secretary*, Geo. O. Friedel, 165 Gayoso Street, Memphis, Tenn. Place of meeting, 38 Madison Street. Ordinary meetings, first and third Tuesdays in each month. Special meetings can be called by Chairman of Board of Directors. Annual meeting, first Tuesday in April. Membership September 1: Honorary, 8; active, 32; total, 35. Exhibitions: Stereopticon, at irregular intervals. Prints, once a year, but at no stated period.

MINNEAPOLIS CAMERA CLUB.—Minneapolis, Minnesota, 15 North 4th Street. Organized 1892. *President*, A. L. Eidemiller; *Vice-President*, W. H. McMullen; *Board of Directors*, C. A. McCollom, E. De Parcq, G. W. Beach, J. B. Lee, Jr., W. B. Augir, H. E. Murdock, and the President, Vice-President, Secretary, and Treasurer; *Treasurer*, A. S. Williams, 15 Central Avenue; *Secretary*, C. J. Hibbard, No. 17 South 4th Street, Minneapolis, Minn. Place of meeting, Club rooms, 15 North 4th Street. Ordinary meetings of Club, second Wednesday of each month. Special meetings at call of President. Annual meeting, regular April meeting. Membership September 1: Active, 40; associate, 13; total, 53. Board of Directors meet on first Wednesday of each month.

MONTREAL CAMERA CLUB.—4 Phillips Square, Montreal, Canada. Organized 1890. Incorporated 1892. *President*, Mr. Edward Stanger; *Vice-President*, Mr. A. J. Ferguson; *Executive Committee*, Messrs Geo. Sumner, Frank Redpath, Charles Lester. Geo McDougall, N. N. Evans, H. T. Barnes; *Treasurer*, Mr. A. C. Lyman; *Secretary*, Mr. Alfred W. Cole, 28 Victoria Street, Montreal. Place of meeting, Club Rooms, 4 Phillips Square. Ordinary meetings, first and third Tuesdays in each month from October till June. Annual meeting, first Tuesday in May. Membership September 1: 75. Exhibitions for coming season: Special exhibition of work entered in summer competition to close September 30. Open competition during winter.

MOUNT VERNON, CAMERA CLUB OF.—Club Rooms, 14 E. First Street, Mount Vernon, N. Y. Organized March 11, 1895 *President*, Mr. B. H. Carmer; *Vice-President*, Mr. Edgar Henriques; *Board of Trustees*, consists of the officers: *Treasurer*, Mr. W. R. Carmer; *Librarian*, Mr. Albert J. Cunningham; *Secretary*, Mary E. Jennings, 512 S. First Avenue, Mount Vernon, N. Y. Place of meeting. Club Rooms, 14 E. First Street Ordinary meetings, second Thursday evening of each month. Special meetings held at call of the President. Annual meeting, second Thursday in January, at 8 P.M. Membership August 1: 26. Exhibitions: First annual exhibition will be held in Club Rooms, Friday, October 18, 1895. Three prizes will be awarded. The Club Rooms are neatly furnished. The walls of the meeting room are ornamented with specimens of the work of the members. The working room is large, and includes three dark-rooms for the use of the members.

MYSTIC CAMERA CLUB.—Medford, Mass. Organized June 4, 1889. Incorporated March 17, 1891. *President*, John F. Wade; *Vice-President*, Chas. A. Clark; *Executive Board*, J. F. Wade, Chas. A. Clark, W. M. Archibald, J. B. Thaxter, Jr., Erving B. Conant, C. A. Staniford, J. Manning Foster; *Treasurer*, Jos. C. Thaxter, Jr.; *Librarian*, Charles A. Staniford; *Historian*, Will C. Eddy; *Secretary*, Warren M. Archibald, 8 South Street, Medford, Mass. Place of meeting, Club Rooms, 28 Main Street, Medford. Ordinary meetings, first and third Tuesday of each month, at 8.15 o'clock P.M. Special meetings at call of Executive Board. Annual meeting, first Tuesday in January. Membership September 1: Honorary, 6; active, 32; associate, 2; total, 40. Exhibitions: April 19, continuing ten days. Other exhibitions held monthly.

NEWARK CAMERA CLUB—Newark, N. J., 224-226 Market Street. Organized April 18, 1888. *President*, Wm. Archibald; *Vice-President*, D. S. Plumb; *Executive Committee*, Miles I. Anson, Col. A. J. Clark, Abraham Van Winkle, W. A. Halsey, A. C. Munn, P. L. V. Thiery, H. W. Smith, F. S. Olds, F. A. Scheuetz; *Treasurer*, J. M. Foote; *Librarian*, Paul Sala; *Secretary*, D. S. Plumb, 24 Boudinot Street, Newark, N. J. Place of meeting, 224-226 Market Street. Ordinary meetings, second and fourth Mondays of each month at 8.15 P.M. Special meetings as called. Annual meeting, second Monday in April. Membership September 1: Honorary, 11; active, 38; associate, 15; total, 64. Public exhibitions not regularly held. Given generally twice a year, spring and autumn, at convenience of Club. Club exhibitions of slides after each regular meeting.

NEWARK (DEL.) CAMERA CLUB.—Newark, Delaware. Organized April 27, 1892. *President*, Prof. T. D. Chester; *Vice-President*, Mr. F. W. Curtis; *Treasurer-Secretary*, W. H. Bishop, Newark, Delaware. Place of meeting, Club Rooms, Newark, Delaware. Ordinary meetings, second Monday of each month, at 8 P.M. Special meetings at call of President upon request of two members. Annual meeting, second Monday of May. Membership September 1: 7.

NEW BRITAIN CAMERA CLUB—New Britain, Conn. Organized 1892. *President*, R. S. Brown; *Vice-President*, E. T. Porter; *Treasurer-Secretary*, F. W. Wood, 273 Main Street, New Britain, Conn.

NEW ORLEANS CAMERA CLUB.—712 Union Street, New Orleans, La. Organized December 17, 1886. *President*, Bernard C. Shields; *Vice-President*, William Gowland; *Board of Directors*, Bernard C. Shields, William Gowland, William Grimshaw, M. V. Haulard, Jeff. C. Wenck, S. L. Mitchel, L. E. Bowman, O. W. Bogel, George Gowland; *Treasurer*, William Grimshaw; *Librarian*, P. S. Benedict, Chairman Library Committee; *Secretary*, M. V. Haulard, 1729 Bienville Aveuue, New Orleans, La. Place of meeting, at Club Rooms, 712 Union Street. Ordinary meetings, on the first Wednesday of each month. Informal meetings are held every Wednesday. Special meetings called by the President at the written request of six members. Annual meeting on first Wednesday in November. Membership September 1: Honorary, 10; active, 70; corresponding, 12; total, 92. Exhibitions: Annual print exhibit given on first Wednesday in May. Lantern-slide exhibitions given once or twice a month during the fall, winter, and spring. The Club is a member of the Lantern-Slide Interchange, Mr. E. M. Haskell, Chairman of the Lantern Committee, being the Director representing this Club in the Interchange. A print competition among the members takes place at the close of each monthly meeting.

NEWTON CAMERA CLUB.—Newton, Mass. *President*, Freeland O. Stanley; *Vice-President*, Dr. E. B. Hitchcock; *Directors*, E. E. Snyder, O. H. Temple; *Treasurer*, Francis W. Sprague, 2d; *Secretary*, Austin S. Kilburn, West Newton, Mass. Ordinary meetings, first Wednesday in the month, except in July, August, September Special meetings when called by officers or members. Annual meeting, first Wednesday in January. Membership September 1: 30. Exhibitions: Probably one in the fall and one next spring.

NEW YORK CAMERA CLUB.—Organized and Incorporated December 14, 1888. *President*, S. W. Bridgman; *Vice-President*, Franklin Harper; *Secretary*, C. W. Stevens; *Treasurer*, Robert J. Devlin, M.D.; *Librarian*, Geo. Trowbridge; *Board of Trustees*, William J. Cassard, William Bunker, Robert J. Devlin, M.D., Harry B. Reid, S. W. Bridgham, C. W. Nason, C. W. Stevens, F. Harper, R. H. Lawrence; *Committee on Admissions*, W. Herbert, Chairman; W. H. Richardson, J. M. B. Hard; *House Committee*, H. B. Reid, Chairman; C. W. Nason, J. V. Van Woert, Geo. H. Fox, J. Arthur Booth, M.D.; *Committee on Lantern Slides Exhibitions*, Richard H. Lawrence, Chairman; W. A. Fraser, W. B. Post, W. D. Murphy, Jas. M. B. Hard; Place of meeting, Club Rooms, 314 Fifth Avenue. Ordinary meetings, monthly. Annual meeting, second Wednesday in January. Membership September 1: Honorary, 5; active, 93; corresponding, 2; total, 100. Exhibition of prints annually. Lantern slides every two weeks during the season. Portrait studio, 341 Fifth Ave., N.Y.

NEW YORK, SOCIETY OF AMATEUR PHOTOGRAPHERS OF.—Metropolitan Telephone Building, Nos. 111, 113 & 115 West 38th Street, New York City. Organized Mareh 10, 1884. *President*, C. C. Roumage; *Vice-President*, Dr. J. H. Stebbins, Jr.; *Recording Secretary*, R. L. Bracklow; *Corresponding Secretary*, T. J. Burton; *Treasurer*, W. E. Johnson; *Directors*, Dr. J. T. Nagle, E. T. Birdsall, Albert Stetson, Louis T. Brush, C. W. Canfield, Harry Coutant, G. F. Basset, Frank M. Hale. Place of meeting, 113 West 38th Street, N. Y. Ordinary meetings, second Tuesday each month, except during July and August. Annual meeting, second Tuesday in April. Special meetings, call of the President. Membership September 1: Honorary, 15; active 130; corresponding, 30; subscribing, 41; total, 216. Publications, *Journal of the Society of Amateur Photographers of New York*. Exhibitions, Members' annual exhibition April in each year.

OLD COLONY CAMERA CLUB.—Smith Block, Liberty Street, Rockland, Mass. Organized February 1, 1890. *President*, David Smith; *Vice-President*, Emery H. Jenkins; *Treasurer*, Emery H. Jenkins; *Secretary*, David Smith, Rockland, Mass. Place of meeting. Smith Block, Liberty Street. Ordinary meetings every other Saturday, 8 P.M. Special meetings at the eall of the President. Annual meeting first Saturday in January. Membership September 1: 14.

OMAHA CAMERA CLUB.—1312 Farnam Street, Omaha, Neb. Organized February, 1894. *President*, Dr. C. W. Hayes; *Vice-Presidents*, 1st, A. S. Billings, Jr.; 2d, L. R Sharp. *Executive Committee*, Dr. C. N. Hayes, L. R. Sharp, E. C. Brownlee, W. F. Durnall; *Treasurer*, E. C. Brownlee; *Librarian*, L. R. Sharp; *Secretary*, W. F. Durnall, 1312 Farnham Street, Omaha, Neb. Place of meeting, Club rooms, 1312 Farnam Street. Ordinary meetings, seeond Monday in each month. Special meetings called by President. Annual meeting, second Monday in February. Membership September 1: Total, 45. Exhibitions: Proposed exhibit in October for this year. Generally held in spring and fall. No regular dates. Free dark-room for visiting members from other clubs.

ONEIDA CAMERA CLUB.—Post Offiee Block, Oneida, N. Y. Organized April, 1894. *President*, B. S. Teale; *Vice-President*, George R. Hanson; *Executive Committee*, R. A. Hill, Chas. H. Parsons, Jacob Staudt; *Treasurer*, Albert Dygert; *Secretary*, Edward R. M. Dougall, 55 Main Street, Oneida, N. Y. Ordinary meetings, first Thursday each month. Annual meeting, April. Membership September 1: 26.

ORANGE CAMERA CLUB.—Orange, N. J. Organized March 9, 1892. *President*, Wm. H. Cheney; *Vice-President*, Edw. H. Graves; *Executive Committee*, W. H. Cheney, Edw. H. Graves, Charles A. Lindsay, Alfred C. Bode, H E Matthews. M. D., Herman Joerns, H. R. Halsey, H. R. Trohum, Wilb. Truman; *Treasurer*. Chas. A. Lindsay; *Librarian*, Wilberforce Truman; *Secretary*, Alfred C. Bode, 359 Main Street, Orange, N. J. Place of meeting, No. 222 Main Street, Orange, N. J. Ordinary meetings, 5th and 20th of each month, except July and August. 8 P.M. Annual meeting, March 20. Membership September 1: Honorary 1; active 48; total, 49. Exhibitions: Annual Lantern Slide Exhibition held in October.

OREGON CAMERA CLUB.—Portland, Oregon. Organized January, 1895. *President*, A. Anderson; *Vice-President*, Dr. Frank E. Ferris; *Treasurer*, W. H. Chapin; *Secretary*, J. A. Hertzman, Box 936, Portland, Oregon. Place of Meeting, Club Studio, 127½ First Street. Ordinary meetings second Monday of each month. 8.30 P.M. Special meetings when necessary. Annual meeting, second Monday in January. Membership September 1: Active. 43; Coresponding, 1; Total, 44. Exhibitions, first Print Exhibition to be held third week of October, 1895, and annually thereafter.

PATERSON CAMERA CLUB.—Paterson, N. J. Organized, 1893. *President*, C. M. Giles; *Vice-President*, H. W. Gledhill; *Treasurer*, W. M. Moore; *Librarian*, F. B. Hoagland; *Secretary*, C. D. Cooke, Paterson, N. J. Place of meeting, 9 Lake Street. Ordinary meetings, first Monday in the month. Annual meeting in May. Membership September 1: 33. The Club is open from 8 A. M. to 10 P.M.

PHILADELPHIA, THE PHOTOGRAPHIC SOCIETY OF.—Philadelphia, Pa. Organized November, 1862. *President*, Joseph H. Burroughs; *Vice-Presidents*, Charles R. Pancoast and Robert S. Redfield; *Board of Directors*, John C. Browne, John G. Bullock, S. Castner, Jr., J. Hunter Ewing, Alex. Hemsley, W. N. Jennings, Chas. L. Mitchell, M.D., A. B. Parvin, Wm. H. Rau, A. W. Robinson, Samuel Sartain, Benj. Sharp, M.D., and the officers; *Treasurer*, George Vaux, Jr.; *Secretary*, Edmund Stirling, care *Public Ledger*. Philadelphia, Pa. Place of meeting, 10 South 18th Street. Ordinary meetings, second Wednesdays of each month. Special meetings, first and fourth Wednesdays of each month. Annual meeting, second Wednesday in April. Membership September 1: Honorary, 5· active, 196; total. 201. Publications, *Journal of the Photographic Society of Philadelphia*. Exhibitions, annual exhibition of work of the members, and monthly display on the wall of current work by members and others.

PITTSBURGH AMATEUR PHOTOGRAPHERS' SOCIETY.—Organized 1886. *President*, W. S. Bell; *Vice-President*, W. S. Clow; *Executive Committee*, C. C. Craft, O. H. Darlington, L. S. Clarke, H. W. Beymer, Horace Moorhead; *Treasurer*, W. J. Hunker; *Secretary*, J H. Hunter, 248 Centre Avenue, Pittsburgh, Pa. Place of meeting, Carnegie Library Building. Ordinary meetings, second Monday of each month, 8 P.M. Special meetings, when called by the President. Annual meeting, second Monday in April. Membership September 1: Honorary, 2; active, 40; total, 42.

PITTSFIELD CAMERA CLUB.—Pittsfield, Mass. Organized 1892. *President*, Clarence G. Tompkins; *Vice-President*, Robert E. Johnston; *Executive Committee*, C. G. Tompkins, R. B. Johnston, J. E. Colton, Allen H. Bagg, J. D. Roscoe, J. F. Middleton and W. G. Goodwin; *Treasurer*, Allen H. Bagg; *Lantern Slide Committee*, A. N. French, J. D. Roscoe, C. G. Tompkins, J. D. Musgrove, F. E. Peirson; *Secretary*, Joseph E. Colton, 118 Elizabeth Street, Pittsfield, Mass. Place of meeting, members' houses. Ordinary meetings, first Monday of each month, at 8 o'clock P.M Special meetings called by the President. Annual meeting, first Monday in February. Membership September 1: Honorary, 16; active, 31; total, 47. Exhibitions are held in the spring of each year, usually in March.

PLAINFIELD CAMERA CLUB.—Plainfield, N. J. Organized September, 1886. *President*, Oscar S. Teale; *Vice-President*, Howard Y. Stillman; *Executive Committee*, Officers and Harold Serrell and J. H. Doane; *Treasurer*, Walter H. Freeman; *Librarian*, F. R. Stevens; *Secretary*, H. H. Coward, 245 East Front Street, Plainfield, N. J. Place of meeting, Club Rooms, Babcock Building. Ordinary meetings, first and third Tuesdays of each month. Annual meeting, third Tuesday in December. Membership September 1: Honorary, 7; active, 49; total, 56. Exhibitions: we propose holding a print exhibition and a fair combined during November.

PORTLAND CAMERA CLUB.—Portland, Maine.: Rooms of Portland Society of Art, Deering Place. Organized February, 1890. *President*, Stanley P. Warren, M.D.; *Vice-President*, Nathan Clifford; *Executive Committee*, F. M. Lawrence, Harry Levy, Wm. Sweat, F. H. Little; *Treasurer*, Clayton T. Whipple; *Secretary*, Frederick Fox, Jr., 66 Union Street, Portland, Me. Place of meeting, Society Art Rooms. Ordinary meetings, first Tuesday of each month. Special meetings whenever called. Annual meeting, first Tuesday in February. Membership September 1: Honorary, 5; active, 46; total, 51. Exhibitions: no regular exhibition given other than slide exhibitions of the American Lantern Slide Exchange about every two weeks.

POSTAL PHOTOGRAPHIC CLUB.—Organized 1888. *President*, Professor Randall Spaulding, Montclair, N. J.; *Treasurer and Secretary*, F. E. Fairbanks, Fitchburg, Mass. Membership September 1: 40. Publications: a monthly Album, to which each member is expected to contribute at least two prints.

PROVIDENCE CAMERA CLUB.—87 Weybosset Street, Providence, R. I. Organized 1883. Incorporated 1889. *President*, R. Clinton Fuller; *Vice-President*, W. Penn Mather; *Executive Committee*, R. C. Fuller, J. A. Miller, Jr., F. P. Wilber, W. A. Dean, E. A. Darling, C. A. Stoddard, E. Q. Gladding, S. B. Burnham, J. E. Davison; *Treasurer*, E. A. Darling; *Librarian*, Geo. F. Curtis; *Recording Secretary*, Fred P. Wilbur; *Corresponding Secretary*, J. Eliot Davison, 112 Cross Street, Central Falls, R. I. Place of meeting, Club Rooms, 87 Weybosset Street. Ordinary meetings, first Tuesday of each month, 8 P.M. Special meetings on call. Annual meeting, first Tuesday in June, 8 P.M. Membership September 1: 57. Exhibitions annually.

QUEBEC CAMERA CLUB.—Quebec, Canada. Organized March 7, 1887. *President*, Captain J. George Garneau; *Executive Committee*, Captain W. E. Imlah, J. B. Amyot; *Treasurer*, James Brodie; *Secretary*, Captain Ernest F. Würtele, R. L., Box 1117, Quebec, Que. Place of meeting, Captain W. E. Imlah's quarters, Citadel. Annual meeting, second Monday in December.

RAMBLERS' PHOTOGRAPHIC CLUB.—Buffalo, N. Y. Organized May 4, 1894. *President*, Dr. J. E. Danelson; *Vice-President*, Conrad L. Baer; *Executive Committee*, President, Vice-President and Secretary; *Judges*, C. L. Baer, J. E. Danelson; *Secretary and Treasurer*, B. F. Marshlow, 368 Connecticut Street, Buffalo, N. Y. Place of meeting, 531 Main Street. Ordinary meetings, last Friday evening in each month at 8 o'clock. Special meetings on call of the Executive Committee. Annual meetings, January. Membership September 1: Total, 18. Exhibitions, annual in February.

SACRAMENTO CAMERA CLUB.—Sacramento, Cal. Organized June 4, 1895. *President*, Dr. J. G. Shaw; *Vice-President*, Leon Adrot; *Directors*, Dr. J. G. Shaw, Leon Adrot, W. G. Woods, Geo. Littlefield, L. W. Nickell, S. B. Nourse, W. D. Kilborn; *Treasurer*, Geo. Littlefield. Place of meeting, 1017 J. Street. Ordinary meetings, first and third Thursdays of each month. Visitors are invited to use rooms at any time.

SAN DIEGO CAMERA CLUB.—San Diego, Cal. Organized 1893. *President*, J. Rodes, M.D.; *Vice-President*, C. Welborn; *Treasurer*, Miss L. B. Anderson; *Secretary*, W. W. Whitson, 1934 4th Street, San Diego, Cal. Place of meeting, D Street, between 4th and 5th Streets. Ordinary meetings, first Tuesday. Annual meeting in January. Membership September 1: Total, 84.

SCHUYLKILL CAMERA CLUB.—Pottsville, Pa. Organized 1889. *President*, A. W. Sheafer: *Vice-President*, Miss E. Roads; *Executive Committee*, A. W. Sheafer, Miss E. Roads, B. S. Simonds, W. L. Sheafer; *Treasurer*, W. L. Sheafer; *Secretary*, Prof. B. S. Simonds; *Assistant Secretary*, R. Y. Patterson, 422 E. Market Street, Pottsville, Pa. Place of meeting, Sheafer Office Building, South Center Street. Ordinary meetings, last Friday in the month at 8 P.M. Special meetings at call of President. Annual meeting in May. Membership September 1: Honorary, 10; active, 61; corresponding, 47; total, 118. Exhibitions, two per month except July.

SEATTLE CAMERA CLUB.—Seattle, Wash. Organized January 28, 1895. *President*, Dr. F. A. Churchill; *Vice-President*, Orion O. Denny; *Executive Committee*, the President, the Secretary, and C. W. Parker, E. M. Carr and J. D. Lowman; *Treasurer*, Chas W. Parker; *Librarian*, the Secretary; *Secretary*, Emil de Neuf, Seattle, Wash. Place of meeting, Club rooms, 621–625 Pioneer Buildings. Ordinary meetings, third Tuesday of each month at 8 P.M. Special meetings as called by the President. Annual meeting, regular meeting in January. Membership August 1: Honorary, 1; active, 51; corresponding, 1; total, 53. Exhibitions projected for December, 1895.

SPRINGFIELD CAMERA CLUB.—Springfield, Mass. Organized October, 1880. *President*, Henry C. Haile; *Executive Committee*, Henry C. Haile, Wm. M. Lester, Chas. C. McElwain, Wm. B. Sleigh, Wm. P. Draper; *Treasurer*, Wm. M. Lester; *Librarian*, Wm. B. Sleigh; *Secretary*, Chas. C. McElwain, 43 Federal Street, Springfield, Mass. Place of meeting, Rooms, corner State and Dwight Streets. Ordinary meetings, third Wednesday in each month at 7.30 P.M. Special meetings at call of Executive Committee. Annual meeting, third Wednesday in October, at 7.30 P.M. Membership September 1: Honorary, 5; active, 50; total, 55.

SAINT JOHN CAMERA CLUB.—Saint John, New Brunswick. Organized 1893. *President*, George A. Henderson; *First Vice-President*, Herbert C. Tilley; *Second Vice-President*, Count de Bury; *Executive Committee*, J. H. Barton, D. Leavitt Hutchinson, R. B. Gilmour, L. L. Griffiths; *Treasurer*, James A. Woodburn; *Secretary*, J. Kaye Allison, P. O. Box 401, St. John, N. B. Place of meeting, Club Rooms and Studio, 65 Prince William Street. Ordinary meetings, second and fourth Mondays at 8 o'clock. Special meetings, first and third Mondays at 8 o'clock. Annual meeting, third Monday in April. Membership September 1: Honorary, 1; active, 53; corresponding, 3; total, 57. Exhibitions: Annual exchange of lantern slides with Clubs of Montreal, Toronto and Hamilton. The club rooms are furnished with a large dark-room, and use of the rooms is extended to visitors while in the city.

ST. LOUIS CAMERA CLUB.—St. Louis, Mo. Organized 1885. Incorporated 1889. *President*, W. H. Wilcox; *Vice-President*, M. T. Corwin; *Treasurer and Secretary*, H. B. Alexander, 4028 Westminster Place, St. Louis, Mo. Place of meeting, 911 North Vanderventer Avenue, first and third Tuesdays. Annual meeting in April. Membership September 1: Total, 46.

ST. PAUL CAMERA CLUB.—St. Paul, Minn. Organized March 6, 1893. *President*, James Paris; *Vice-President*, D. F. Brown; *Directors*, Officers and W. A. Russell, E. F. Zimmerman, C. H. Buckley, Lorn Campbell, J. C. Jensen, A. M. P. Cowley; *Treasurer*, W. B; Thorne, *Secretary*, W. J. Sonnen, care of St. Paul Fire and Marine Ins. Co., St. Paul, Minn. Place of meeting, Third and Jackson Streets. Ordinary meetings,, no regular meetings during summer months. Special meetings at call of five members. Annual meeting, March. Membership September 1: Honorary, 1; active, 38; total, 39.

SYRACUSE CAMERA CLUB.—Syracuse. N. Y. Organized 1886. Incorporated January, 1892. *President*. W. H. Olmsted; *Vice-President*, Geo. Timmins; *Directors*, George Timmins, Herbert F. Smith. E. C. Howe, E. H. Burdick, Fred. Frazer, J. R. Clancy and J. D. Pennock; *Lantern Slide Director*. Will H Olsted; *Treasurer*, J. D. Pennock; *Secretary*, Herbert F. Smith, 1315 Spring Street, Syracuse, N. Y. Place of meeting, 322 South Salina Street. Syracuse, N. Y. Ordinary meetings, every Friday evening at 8 o'clock. Annual meeting, first Friday evening in January. Membership September 1: Active, 80; associate, 12; total, 92. Club outings May and October in each year. Public Slide exhibitions in March each year. Print exhibitions occasionally.

"TECH" CAMERA CLUB.—Worcester (Mass.) Polytechnic Institute. Organized September, 1889. *President*, Henry J. Fuller; *Vice-President*, A. L. Smith; *Executive Committee*, all Officers; *Treasurer*, John W Higgins; *Keeper*, C. M. Whitney; *Secretary*, John W. Higgins, 228 West Street, Worcester, Mass. Place of meeting, Boynton Hall, Worcester Polytechnic Institute. Ordinary meetings at call of President and Secretary. Annual meeting, second week in September. Membership September 1: Honorary, 6; active, 7; total, 13. Exhibitions: fall annual.

TECHNOLOGY PHOTOGRAPHIC SOCIETY.—Massachusetts Institute of Technology, Boston, Mass. Organized 1887. *President*, H. A Poppenhusen, '96; *Vice-President*, W. M. Partridge '96. *Executive Committee*, President, Vice-President, Secretary, Treasurer and F. Kleinschmidt, '95; *Treasurer*, A. C. Lawley, '97; *Secretary*, E. J. Loring. Place of meeting, 26 Rogers Building, 491 Boylston Street. Ordinary meetings, second Tuesday of each month, 1 P.M. Special meetings whenever called. Annual meeting in September. Membership May 15: Honorary, 10, active, 20; total, 30. Exhibition "Junior Week" (usually Easter week).

TOPEKA CAMERA CLUB.—Topeka, Kansas. Organized September 5, 1894. *President*, Clifford C. Baker; *Vice-President*, William E. Swift; *Directors*, C. C. Baker, William E. Swift, W. C. F. Reichenbach, W. C. Culver, Robert Thompson, Mrs. W. E. Swift, F. G. Willard; *Treasurer*, W. K. Culver; *Secretary*, Mrs. William E. Swift, 624 Taylor Street. Topeka, Kansas. Place of meeting, homes of club members. Ordinary meetings, first and third Tuesdays of each month, 8 o'clock P.M Annual meeting, first Tuesday in January. Membership September 1: Honorary 8; active, 39; total, 42.

TORONTO CAMERA CLUB.—Corner Yonge and Gerrard Streets, Toronto, Canada. Organized 1887. *President*, Edmund F. King, M.D.; *First Vice-President*, W. H. Moss; *Second Vice-President*. G. R. Baker; *Executive Committee*, Hugh Neilson, J. G. Ramsey, A. W. Croil, A. R. Blackburn, W. B. Varley, Bert Smith; *Treasurer*. Ernest M. Lake; *Secretary*, Ernest M. Lake, 14 King Street, West, Toronto, Canada, Place of meeting, corner Yonge and Gerrard Streets. Ordinary meetings, Monday evenings at 8 o'clock from October 1 to May 1. Special meetings at call of Executive Committee. Annual meeting, first Monday in November. Membership September 1: Honorary, 4; active, 112; non-resident, 4; total, 120. Exhibitions annually—in February or March. Open to all amateurs. Gold, silver and bronze medals. Members of the American Lantern Slide Interchange. Our rooms consist of entertainment hall, 20x50; studio with fine north light; 8x10 portrait camera, backgrounds; dressing-room and dark-room attached to studio; general dark-room on stall system; electric light enlarging apparatus; work and locker room. All leading publications received. Visiting amateurs are always welcome.

UNIVERSITY CAMERA CLUB.—Lincoln, Neb. Organized January 9, 1892. *President*, Miss Helen Gregory; *Vice-President*, Dr. R. A. Clark; *Executive Committee*, Officers ex-officio; *Secretary and Treasurer*, Miss Adaline Quaintance, P. O. Box 675, Lincoln, Neb. Place of meeting, Room 4, Chemical Laboratory, State University, Lincoln, Neb. Ordinary meetings, first Tuesday of each month during school year. Annual meeting, in May. Membership September 1: Honorary, 5; active, 25; corresponding, 3; total, 33. Exhibitions: annual, held in June, the day before commencement.

WATERBURY, PHOTOGRAPHIC SOCIETY OF.—Waterbury, Conn. Organized May, 1888. *President*, H. T. Steadman; *Vice-President*, L. S. White; *Executive Committee*, Frank Welton, Fred. Root, H. G. Filley, Mrs. H. T. Steadman, Miss

Alice Depew; *Treasurer*, W. H. Hodges; *Secretary*, G. H. Word, 14 Division Street, Waterbury, Conn. Place of meeting, Brown's Block, South Main Street. Ordinary meetings, first and third Tuesdays of each month. Membership September 1: Active, 66. Exhibitions, every two weeks.

WORCESTER CAMERA CLUB.—Worcester, Mass. Organized 1892. *President*, E. C. A. Becker; *Treasurer*, A. A. Barker; *Secretary*, D. F. Gay, 214 Main Street, Worcester, Mass. Place of meeting, Walker Building, 405 Main Street. Membership September 1: 65.

YOUNG LADIES' CAMERA CLUB.—Minneapolis, Minn. Organized November, 1894. *President*, Miss Mabel Jameson; *Vice-President*, Miss M. Belle Jeffery; *Treasurer*, Minerva Turnbull; *Secretary*, M. Eva McIntyre, 1833 Portland Avenue, Minneapolis, Minn. Place of meeting, 808 Nicollet Avenue, at the rooms of the Young Woman's Christian Association. Ordinary meetings, the first Wednesday of each month. Special meetings, an outing each month in summer.

## FOREIGN PHOTOGRAPHIC SOCIETIES.

### GREAT BRITAIN AND IRELAND.

ABERDEENSHIRE AMATEUR PHOTOGRAPHIC SOCIETY.—Hon. Secretary, James Main, 75 Broad Street, Aberdeen.

ACCRINGTON AND DISTRICT CAMERA CLUB.—Hon. Secretary, Isaac Hanson, Rothwell Heights, Accrington.

AMATEUR PHOTO-ALBUM CLUB.—Hon. Secretary, S. Jessop, 96 Manchester Road, Nelson.

ALDENHAM INSTITUTE CAMERA CLUB.—Hon. Secretary, E. Pringle, Aldenham Institute, Goldington Crescent, Pancras Road, London, N. W.

ALTRINCHAM PHOTOGRAPHIC SOCIETY.—Altrincham, Cheshire. Hon. Secretary, J. Taylor Hughes, Ashley Park, Altrincham.

AMATEUR PHOTOGRAPHIC ASSOCIATION.—Secretary, Arthur James Melhuish. Office, 58 Pall Mall, London, S. W.

AMATEUR PHOTOGRAPHIC RESEARCH CAMERA CLUB.—Secretary, J. C. W. Davidson. Windsor Park, Belfast, Ireland.

ARBROATH AMATEUR PHOTOGRAPHIC ASSOCIATION.—Hon. Secretary, J. Hood, 94 High Street, Arbroath.

ASHTON-UNDER-LYNE PHOTOGRAPHIC SOCIETY.—Hon. Secretary, Robt. T. Marsland, 24 Park Parade, Ashton-under-Lyne.

ASTON NATURAL HISTORY AND PHOTOGRAPHIC SOCIETY (PHOTO SECTION).—Hon. Secretary, F. W. Pilditch, 185 Bevington Road, Aston Park.

AYLESBURY AMATEUR PHOTOGRAPHIC SOCIETY.—Hon. Secretary, J. F. Roche, 2 St. Mary's Square, Aylesbury.

BANBURY AND DISTRICT PHOTOGRAPHIC SOCIETY.—Hon. Secretary, J. Davenport, Brookfield, Banbury.

BARNSLEY AND DISTRICT PHOTOGRAPHIC SOCIETY.—Hon. Secretary, C. R. Barham, 9 Corporation Street, Banbury.

BATLEY AND DISTRICT PHOTOGRAPHIC SOCIETY.—Secretary, A. S. Fox, Springfield Villa, Batley.

BATH PHOTOGRAPHIC SOCIETY.—Secretary and Treasurer, W. Middleton Ashman, 12A Old Bond Street, Bath.

BEVERLEY PHOTOGRAPHIC SOCIETY.—Secretary, T. J. Morley, Toll Gavel, Beverley, East York.

BIRMINGHAM PHOTOGRAPHIC SOCIETY.—Secretary, C. J. Fowler, Court Mount, Erdington, near Birmingham.

BLAIRGOWRIE AND DISTRICT PHOTOGRAPHIC ASSOCIATION.—Hon. Secretary, A. Folkarde, 16 Perth Street, Blairgaurie, Scotland.

BOLTON PHOTOGRAPHIC SOCIETY.—Secretary, C. K. Dalton, 50 Higher Bridge Street, Bolton.

BOOTLE PHOTOGRAPHIC SOCIETY.—Hon. Secretary, B. Cartwright, 50 High Street, Galashiels.

BORDER AMATEUR PHOTOGRAPHIC ASSOCIATION.—Hon. Treasurer and Secretary, B. Cartright, 50 High Street, Galashiels, N. B.

BOSTON CAMERA CLUB.—Hon. Secretary, A. H. Smith, Boston, Lancs.

BOURNEMOUTH SCIENTIFIC AND ANTIQUARIAN SOCIETY (PHOTOGRAPHIC SECTION).—Hon. Secretary, E. Greenleaves, Priory Mansions, Bath Road, Bournemouth.

"BOYS' OWN" POSTAL PHOTOGRAPHIC CLUB.—Hon. Secretary, J. E. Hardwich, 7 Bedford Terrace, Sunderland.

BRADFORD PHOTOGRAPHIC SOCIETY.—Hon. Secretary, J. Snowden, 5 Godwen Street, Bradford.

BRECHIN PHOTOGRAPHIC ASSOCIATION.—Hon. Secretary, A. McLeod, Brechin, N. B.

BRIGHOUSE PHOTOGRAPHIC SOCIETY.—Hon. Secretary, J. H. Georgison, Huddersfield Road, Brighouse.

BRIGHTON PHOTOGRAPHIC SOCIETY.—Hon. Secretary, E. Burnham, 9 St. James Street, Brighton.

BRIGHTON AND SUSSEX NATURAL HISTORY AND PHILOSOPHICAL SOCIETY (PHOTOGRAPHIC SECTION).—Hon. Secretary. Douglas E. Caush, 63 Grand Parade, Brighton.

BRISTOL AND WEST OF ENGLAND AMATEUR PHOTOGRAPHIC ASSOCIATION.—Hon. Secretary, E. Brightman Lyndale, Redland Road, Bristol.

BRISTOL CAMERA SOCIETY.—Hon. Secretary, E. R. Jakeways, Hope Villa, St. Mark's Road, Bristol.

BRITISH ASSOCIATION FOR THE ADVANCE OF SCIENCE.—Burlington House, London, W. Secretary, G. Griffiths, M.A., College Road, Harrow.

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*Lake George*—Fort William Henry Hotel.
*Lake George, Bolton*—Lake View House.
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By W. Arnold.

SCHOONER "ALCAEA."

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Photo by Morrison, Chicago.

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WALTER E. WOODBURY,
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From The Photographic Times.
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EYE OF A SPIDER.

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From The Photographic Times

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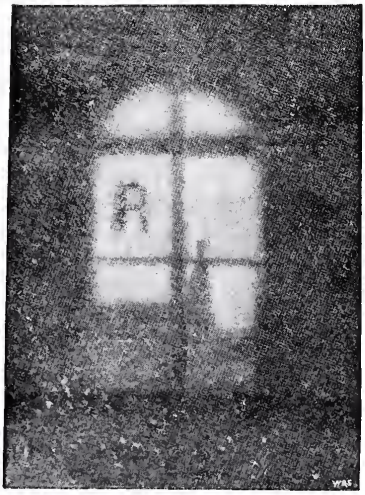
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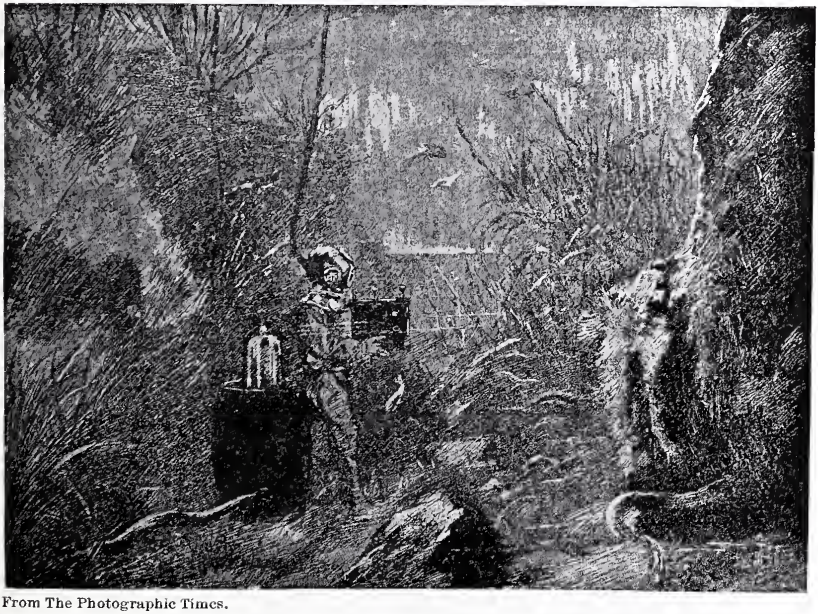
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[See next page.]

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By Geo. L. Wilms. DECEMBER EVE. The Gill Engraving Co., N.Y.

# A Good Thing to have

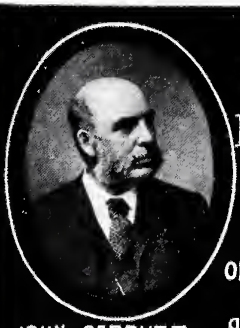


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## The Photo-Chrome Engraving Co.

162=166 Leonard Street,
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Telephone Call—1273 FRANKLIN.



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MANUFACTURER OF
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WAYNE JUNCTION,
PHILADELPHIA.

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## Half-Tone Process Plates

Specially made for Photo-Etchers on Copper, Brass or Zinc, giving negatives equal if not Superior to

## Wet Collodion Plates.

**PRICE LIST—PLAIN, ORTHOCHROMATIC AND STRIPPERS.**

| Sizes. | Per Doz. Plain or Ortho. | Per Doz. Strippers. | No. of Doz. in case. | Sizes. | Per Doz. Plain or Ortho. | Per Doz. Strippers. | No. of Doz. in Case. |
|---|---|---|---|---|---|---|---|
| 3¼ x 4¼ | $0 45 | $0 70 | 36 | 6½ x 8½ | $1 65 | $2 20 | 12 |
| 4 x 5 | 0 65 | 0 90 | 36 | 8 x 10 | 2 40 | 3 20 | 12 |
| 4¾ x 6½ | 1 00 | 1 25 | 24 | 10 x 12 | 3 80 | 5 00 | 4 |
| 5 x 7 | 1 10 | 1 45 | 24 | 11 x 14 | 5 00 | 6 65 | 3 |
| 5 x 8 | 1 25 | 1 65 | 24 | 14 x 17 | 9 00 | 12 00 | 2 |

### CARBUTT'S FLUID STRIPPING MEDIUM,

Which has been arrived at after a series of exhaustive experiments, is destined to entirely supersede the old Gelatine processes. It is supplied already prepared from the factory. It is applied *cold*, sets and dries quickly, forming a pellicle negative, *thin*, *tough and flexible*, and may be printed from either side. Full particulars for use accompany each package.

**PRICE: Pint Bottles, 75c.; Quart Bottles, $1.35; per Gallon, $5.00.**

"We have been in the photo-engraving business over three years. Used wet-plates for two years, and your process-plates for the last year on half-tone work. Each lot seemed uniform with the others and worked well. Have not had a wet-plate bath in the place, even for line work (or half-tone either) for over a year, and have turned out just as good half-tone work as can be done, so our customers say. It is as good as we could ever get with wet-plates."

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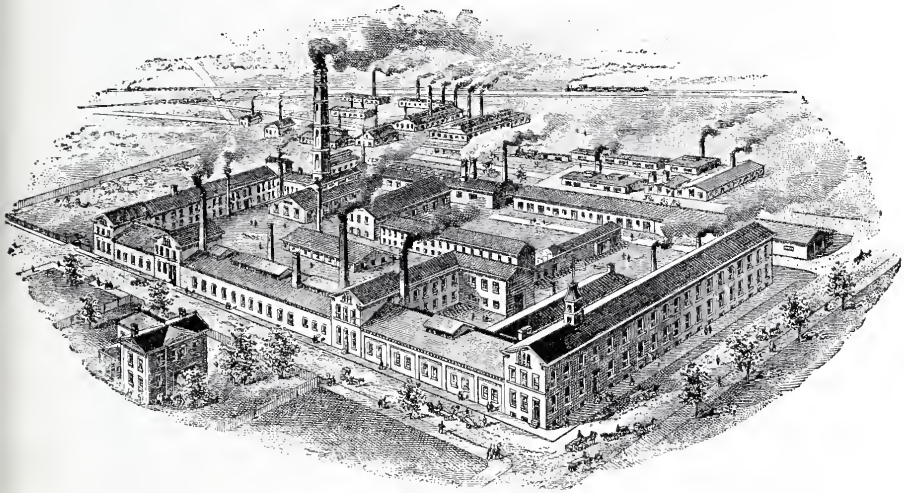
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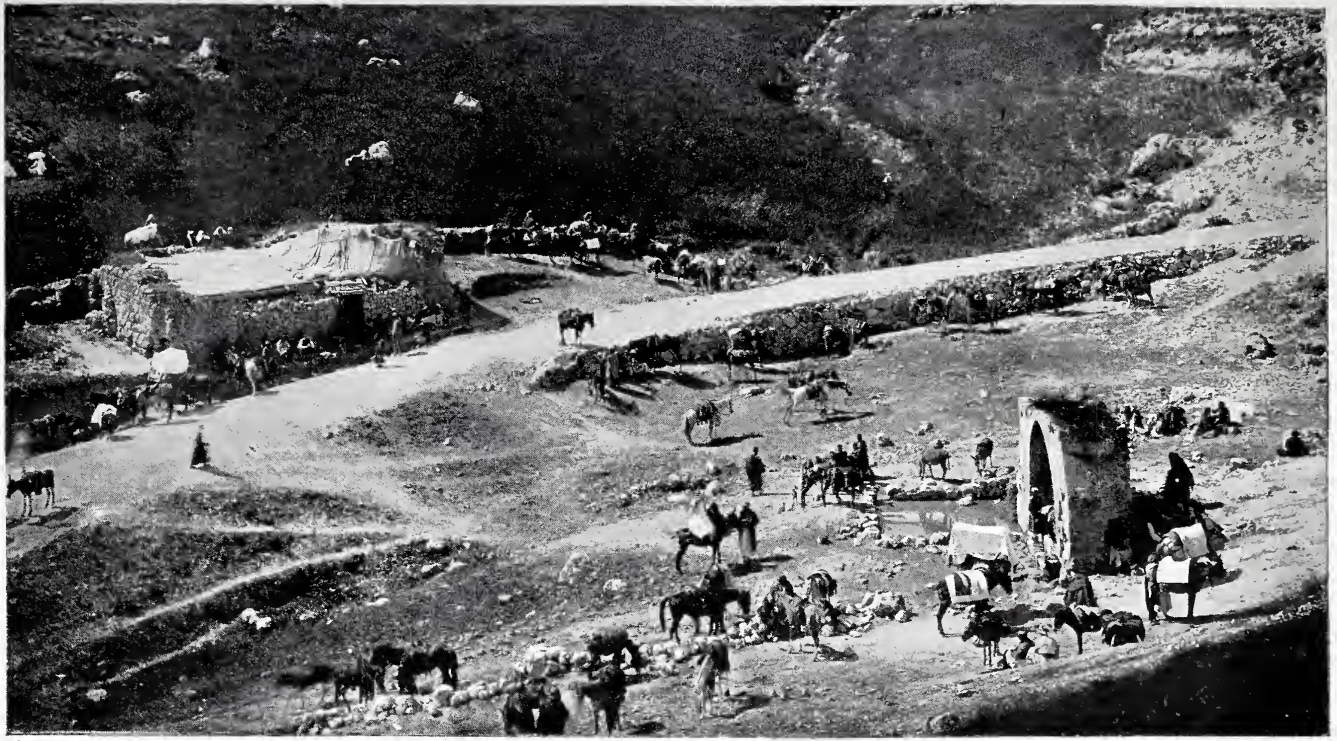
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**will be found, upon comparison, to be superior in every respect to all other brands on the market. Its distinctive points of superiority are:**

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**2D.—PERFECT CRYSTALLIZATION**

**3D.—IMMACULATE WHITENESS**

**4TH.—EXTREME LIGHTNESS**

**5TH.—MODERATE COST**
(Its price is not higher than that of any other make.)

## Merck's Pyrogallic Acid

produces the highest intensity to be desired in a photographic plate, and, at the same time, the finest detail in light and shade required for the most perfect printing negative.

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(OVER)

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"I have tested Merck's pyro carefully in comparison with the other pyros at present on the market, and I find that it is superior to any and all of them."

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Instructor of the Chautauqua School of Photography.

"I shall, in future, certainly use no other pyro but Merck's. The best is always good enough for me."

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Editor *American Amateur Photographer*.

"Merck's Pyrogallic Acid will be found a very superior article. Its purity is absolute, with quick crystallization and immaculate whiteness. In use, it produces the highest intensity that can be desired in the negatives. The detail in light and shade is perfect, producing printing qualities unsurpassed by any pyro we have ever used."

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Editor of *The Photographic Times*.

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B. W. KILBURN,
Official Photographer (Stereoscopic), at the Columbian World's Fair, and San Francisco Mid-Winter Exposition.

I have tried Merck's pyro and must certainly say it is the best I ever used. The results I have obtained with it are remarkably fine."

W. B. POST,
Amateur Photographer, New York.

MORENO STUDIO, Fifth Ave., New York.

"I have been using Merck's pyro in my studio, and am very well pleased with it. It is clean, gives brilliant negatives, and is reliable, one day's work being exactly the same as another's."

A. MORENO.

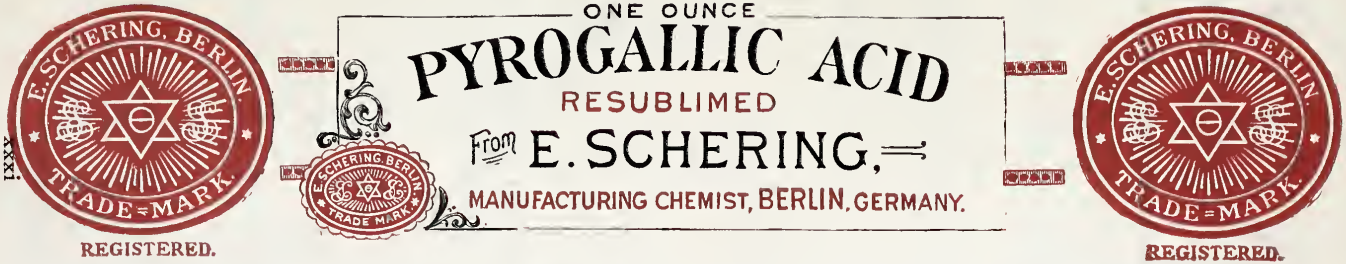
"I have been using Merck's pyro, and am ready to indorse the high praise which you have found it entitled to: 'that it is superior in point of purity, lightness and solubility' to any like product that I have seen. In fact, 'the new and improved process' seems to reach in its result the point beyond which it is impossible to go—that is, perfection. This was my impression at first sight, and using serves only to confirm it.

In my opinion, pyro stands at the head of all developers of dry plates, and I am much mistaken if Merck's pyro, when known, does not lead all brands of pyro."

W. H. SHERMAN,
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When purchasing a Developer please be particular to specify **Schering's** the oldest and most favorably known brand.

*Put up with labels and seals as per fac-similes here given.*




THE STANDARD OF THE LAST—THIRD—EDITION OF THE GERMAN PHARMACOPŒIA.

## See that you get the Genuine "Schering's." Excelled by none.

**Send Orders to your Dealers, or to**

**THE SCOVILL & ADAMS COMPANY, NEW YORK.**

# ANTHION-SCHERING

## The Best Hypo Eliminator.

## DIRECTIONS FOR USE.

### THE SOLUTION.

Five grammes (75 grains) **Anthion** are dissolved in one litre (one quart) of luke-warm distilled water. The solution keeps for at least one month.

### *A. For Gelatine Plates.*

*a.* The plate (13x18 centimetres—5x7 inches) or film, after fixing, is allowed to drain and then washed for about five minutes in a dish with about 600 cubic centimetres (20 fluid ounces) water; it is then again allowed to drain.

*b.* Afterward it is laid in a second dish with 200 c.c. (7 fluid ounces) **Anthion solution,** and again allowed to remain for five minutes with occasional stirring.

*c.* The plate is then once more laid in 600 c.c. (20 fluid ounces) fresh water, exactly according to direction *a*.

*d.* The operations *b* and *c* are repeated.

The plate is then **free from fixing soda.** (In order to determine this proceed as follows:)

### *Test.*

To be certain that all the fixing soda is completely destroyed, proceed as follows: Several c.c. (half to one teaspoonful) of the last washing water are poured into a test-tube, and three or four drops silver nitrate solution (1 to 20) added. A white precipitate generally forms. If this gradually acquires a **yellow** tint, fixing soda is still present.

In such a case operations *a* and *b* are to be repeated.

### *B. For Positive Paper Prints.*

The operations are carried out as under A, but instead of one plate five fixed copies (13x18 c c.—5x7 inches) are taken, allowed to drain one by one, then laid singly in water (vide *a*), afterward in **Anthion solution** (vide *b*), then again in water (vide *c*), again in **Anthion solution** (vide *d*), and finally in water.

☞ **It is important that the paper prints are frequently separated in the different baths.** If the prints stick together, the solution does not penetrate and cannot act.

### = IMPORTANT =

For large plates and prints it is not only necessary to use larger dishes, but also more liquid, both **Anthion solution** and water. An excess of **Anthion** or of water is decidedly useful, but less is disadvantageous.

The above directions for washing relate to those who have no continual flow of water at hand.

If a continual flow of water is obtainable, it is advisable to wash the plates or prints in flowing water for a quarter of an hour, and then dip in the **Anthion solution** and test the result as above.

**Send orders to your Dealers, or to**

***The Scovill & Adams Co., - - - New York.***

THE

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of New York,

SUCCESSORS TO THE

PHOTOGRAPHIC DEPARTMENT

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AN UNEQUALED VARIETY OF

# Photographic Goods,

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*Has never been Excelled, or even Equaled,*

In Variety of Design,

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and in Fineness of Finish.

**FIRST PRIZES EVERYWHERE.**

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Cameras, Stands,
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- ☞ Scovill Apparatus.
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- ☞ Zeiss Anastigmatic Lenses.
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- ☞ Three Crown Albumen Paper.
- ☞ Ilo (Collodion) Aristotype Paper.
- ☞ N. Y. (Gelatine) Aristotype Paper.
- ☞ Waterbury Cardboard.
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AND

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Any desired tones obtained.
**The greatest paper for hot or damp climates.**
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Chemically Pure Photo Blotting Paper.

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### *COLLODION PAPER*

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GIVES most beautiful results. Does not curl, crack or peel, and is toned in the combined or separate bath.

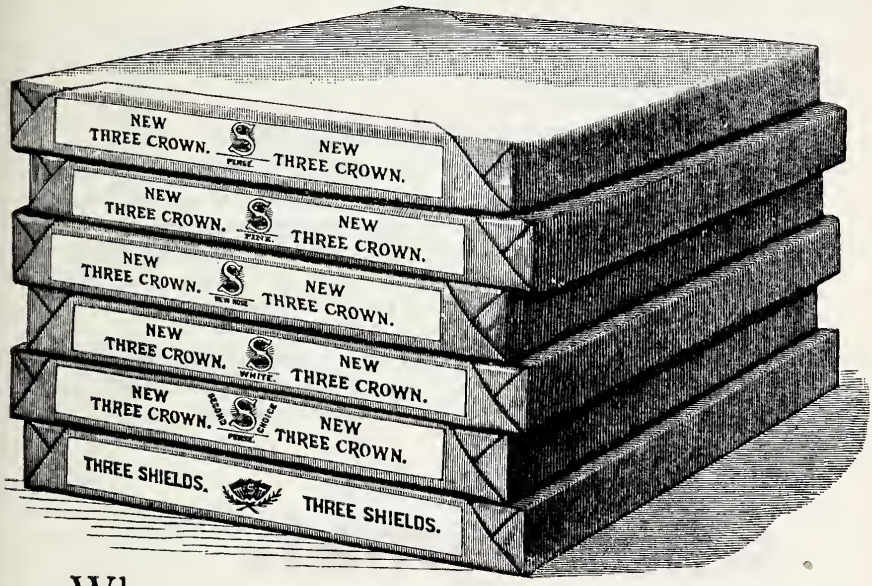
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Because none but the Best of the Rives Paper is selected for Albumenizing the THREE CROWN BRAND. It is therefore free from the imperfections often to be found in other brands, which arise from imperfections in the plain paper.

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## Celebrated Photographic Objectives.

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Beware of lenses made and sold by others under the names "Rectigraphic" and "Perigraphic"; they are either not the genuine patented lenses, or they are infringements.

### THE GUNDLACH
# Anastigmat.

The finest Universal Lens made; the only **absolutely** anastigmatic; crisp sharpness and even illumination from centre to corner at full aperture.

### THE GUNDLACH
# Wide-Angle Anastigmat.

The only real instantaneous Wide-Angle Lens made. A 5½ inch focus lens covers 6½ x 8½ plate with full aperture (*f*: 8) anastigmatic to the corner.

### THE GUNDLACH
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**A Semi-Anastigmat;** crisp sharpness at full aperture.

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LENS

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Is the BEST
Lens
Made
Anywhere.

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SOLE IMPORTERS.

SEND FOR PARTICULARS.

# Cameras at Bargain Prices.

The following Cameras are new goods, not shopworn, and are exactly as described. We happen to be a little overstocked with some of them, and therefore offer them at the following bargain prices, which are strictly **Cash**:

| | Catalogue Price. | Bargain Price. |
|---|---|---|
| 4½ x 6½ Elite Outfit | $17 00 | $11 50 |
| 5 x 7 " | 17 50 | 12 00 |
| 5 x 8 " | 18 00 | 12 00 |
| 6½ x 8½ " | 22 00 | 15 00 |

The Elite Camera is a single swing mahogany polished box, with vertical shifting front, rubber folding bellows, rack and pinion focusing adjustment, and the outfit consists of tripod, Waterbury lens, carrying case, etc.

| | | |
|---|---|---|
| 4 x 5 Waterbury Outfit | 12 00 | 8 00 |
| 4½ x 5½ " " | 13 00 | 9 00 |
| 4½ x 6½ " " | 14 00 | 9 50 |
| 5 x 8 " " | 16 00 | 10 50 |

Similar to Elite, but not quite so highly finished.

| | | |
|---|---|---|
| 4 x 5 Flandreau Camera | 17 00 | 9 00 |
| 5 x 7 " " | 22 00 | 12 00 |

Very compact, nickel trimmings, polished mahogany, reversible, swing back and front, rising front board.

A few only:

| | | |
|---|---|---|
| St Louis Camera, 4½ x 5½ S.S. | 26 00 | 13 00 |
| " " 4½ x 5½ D.S.B. | 30 00 | 15 00 |
| " " 4 x 6½ S.S. | 30 00 | 15 00 |
| " " 4 x 6½ D.S.B. | 34 00 | 17 00 |

A reversible back, mahogany camera, very fine.

| | | |
|---|---|---|
| One 4 x 5 Irving Single Swing Camera | 27 00 | 18 00 |
| One 5 x 7 Folding Waterbury Back, F. Gundlach "Star" lens | $50 00 | $27 50 |
| One 4 x 5 Folding Waterbury Back, no lens | 40 00 | 20 00 |
| One 8 x 10 Landscape Single Swing Camera. A very handsome highly finished Camera | 25 00 | **12 50** |
| One only. Rival 4 x 5 Detective Camera, double R.R. lens | 30 00 | **24 00** |

Butterfly Shutter, fitted with six double plate holders, double finder, etc. Covered with first quality grained leather. A special bargain.

| | | |
|---|---|---|
| One 4 x 5 Mascot Camera, with Eastman roll-holder | 30 00 | 20 00 |
| 4 x 5 Knack Camera, antique oak finish | 15 00 | 10 00 |
| 4 x 5 Knack Camera, leather covered | 17 50 | 12 00 |
| 4 x 5 New Waterbury Camera, with 3 double holders | 15 00 | 12 00 |
| One 3¼ x 4¼ Bristol Magazine Camera | 30 00 | **10 00** |
| One 5 x 8 Leader View Camera, | 24 00 | 15 00 |
| One 6½ x 8½ Leader View Camera | 24 00 | 15 00 |
| 4 x 5 Favorite Outfit, with extra 4½ x 5½ holder | 10 00 | 6 33 |
| 5 x 7 Favorite Outfit, with extra holder | 12 00 | 7 60 |
| 4 x 5 D. S. B. Revolving Back Camera | 32 00 | 18 00 |

**THE SCOVILL & ADAMS COMPANY OF NEW YORK,**

**423 BROOME STREET.**

Some . . .

# Special Henry Clay Cameras at Bargain Prices

The following **Henry Clay Cameras** are new goods in perfect condition. They were made especially to order, and for one reason or another have not been sold; hence we offer them at the following reduced prices, which are net cash in every instance.

As there are only one of each camera a prompt response is necessary in order to secure any particular instrument. We advise telegraphic orders.

---

**A 4 x 5 Henry Clay Camera,** with special Rapid Rectilinear Lens and Le Vergne Time and Instantaneous Shutter.
Regular price, $65.00. Special Bargain price, $50.00.
NOTE.—The Le Vergne Shutter is a very accurately adjusted instrument for time and instantaneous exposures; is fitted with an Iris Diaphragm, Pneumatic Release, and adjusted so that any fraction of a second may accurately be given on exposure.

**A 4 x 5 Henry Clay Camera,** complete with an Eastman Roll Holder; also one Double Light-weight Plate Holder.
Regular price, $62.50. Bargain price, $48.00.
This Camera has the regular Henry Clay Rapid Rectilinear Lens and a Pneumatic Time and Instantaneous Shutter.

**A 5 x 7 Henry Clay Camera,** without Lens or Shutter, **Aluminum Mountings.**
This Camera makes a very handsome appearance with the white metal trimmings. It is especially desirable for one of the new Zeiss or Swift Lenses with Aluminum mountings, and is, of course, very much lighter than the regular camera with brass trimmings.
Special Bargain price, $38.00.

**A 5 x 7 Henry Clay Camera,** complete, with a plain Scovill & Adams Shutter; that is, without Pneumatic Release. This is the original Henry Clay which sold for $50.00, and we have only one left, which we will sell for $30.00.

**A 5 x 7 Henry Clay Camera,** with Three Double Light-weight Holders, contained in a box, with the regular Henry Clay Lens and Shutter, Pneumatic Release.
Regular price, $57.60. Bargain price, $46.00.

**A 5 x 7 Henry Clay Camera,** like the above in every respect, with Bausch & Lomb Shutter. Bargain price, $47.00

**A 5 x 7 Henry Clay Camera,** Stereoscopic, less Lenses and Shutters, Double Swing Front. Regular price, $50.00. We will sell for $40.00.

**A 5 x 7 Henry Clay Camera,** Stereoscopic, Double Swing Front, with Roll Holder less Lens and Shutter. Regular price, $65 00. Bargain price, $50.00.

**A 5 x 8 Henry Clay Camera,** Stereoscopic, Single Swing Front, less Lens and Shutter. Regular price, $46.00. Bargain price, $36.00.

**An 8 x 10 Henry Clay Camera,** Double Swing Front, less Lens and Shutter, fitted with One Double Light-weight Holder.
Regular price, $50.00. Will sell for $40.00.

**One 4 x 5 Henry Clay, Jr.,** with Three Double Light-weight Holders.
Regular price, $32.60, inciuding Holders. Will sell for $24.00.

**One 4 x 5 Henry Clay, Jr.,** with Simplex Shutter, with Three Double Light-weight Holders. This Shutter is a special one which cost $13.00, making the total cost of the Camera, with Holders, $45.00. Bargain, $35.00.
NOTE.—This is a special bargain, as the Camera, with the Lens and Shutter, which it contains, is virtually as good as the regular Henry Clay.

**One 5 x 7 Henry Clay, Jr.,** without Lens or Shutter. Special Bargain price, $25.00.

---

*The above Cameras, unless stated otherwise, all contain one Double Light-weight Plate Holder. They are exactly as described, and will be sold for cash only.*

---

## The Scovill & Adams Company of N. Y.,

**423 Broome Street, New York.**

# Lenses Below Cost

The following list of Lenses are offered at prices which are **ACTUALLY BELOW COST.** They are, of course, strictly CASH prices. Orders will be filled in rotation as received, until the stock is all sold.

| | REGULAR PRICE. | REDUCED PRICE. |
|---|---|---|
| 1 8 x 10 Morrison Full Figure Lens. | $90 00 | $45 00 |
| 1 Morrison Lens for Pantascope Camera | 25 00 | 5 00 |
| 1 6 in. 4-5 Instantaneous Morrison Wide Angle Lens | 25 00 | 10 00 |
| 1 No. 2 Morrison Leukoscope, 17x20, Portrait Lens | 170 00 | **90 00** |
| 1 No. 3 Morrison Leukoscope, 16x18, Portrait Lens | 150 00 | **60 00** |
| 1 No. 4 Morrison Leukoscope, 11x14, Portrait Lens | 100 00 | **42 00** |
| 1 5x8 Wale Lens, W. D. | .... | 6 00 |
| 1 4x5 Gundlach Star Lens | 9 00 | 5 75 |
| 1 8x10 " W. A. Lens | 35 00 | 22 50 |
| 1 6½x8½ " R. R. " | 38 00 | 23 50 |
| 1 ⅝ W. D. Lens, of the celebrated makers, Bertiner, of France | 30 00 | 15 00 |
| 1 6½x8½ Ross Rapid Symmetrical, with Triplex Shutter. | 65 00 | 48 75 |
| 1 No. 5, Series II, Bausch & Lomb, Zeiss Lens | 64 00 | 42 50 |
| 1 No. 7, Series III, Bausch & Lomb, Zeiss Lens | 84 00 | 68 25 |
| 1 No. 1, Series IV, Bausch & Lomb, Zeiss Lens | 17 50 | 12 00 |
| 1 No. 2, Series IV, Bausch & Lomb, Zeiss Lens | 17 50 | 12 00 |
| 1 No. 3, Series IV, Bausch & Lomb, Zeiss Lens | 21 00 | 12 00 |
| 1 No. 4, Series IV, Bausch & Lomb, Zeiss Lens | 24 00 | 17 00 |
| 1 No. 5, Series IV, Bausch & Lomb, Zeiss Lens | 32 00 | 24 00 |
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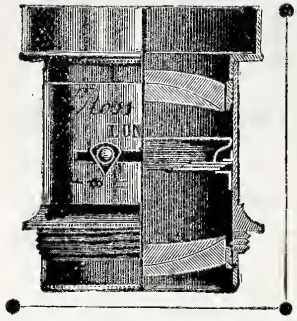
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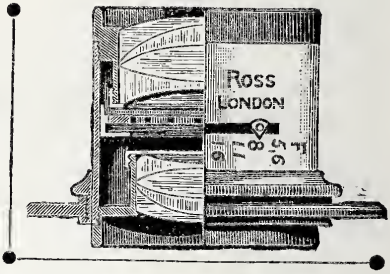
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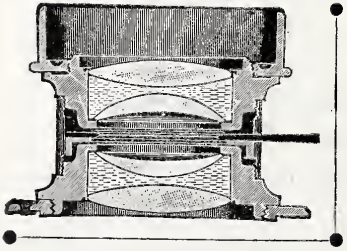
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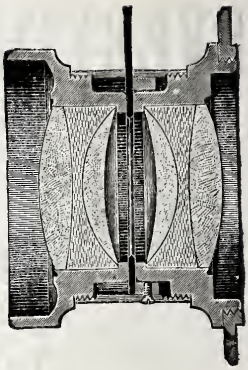
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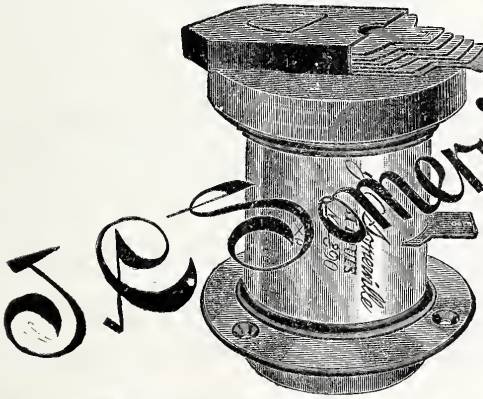



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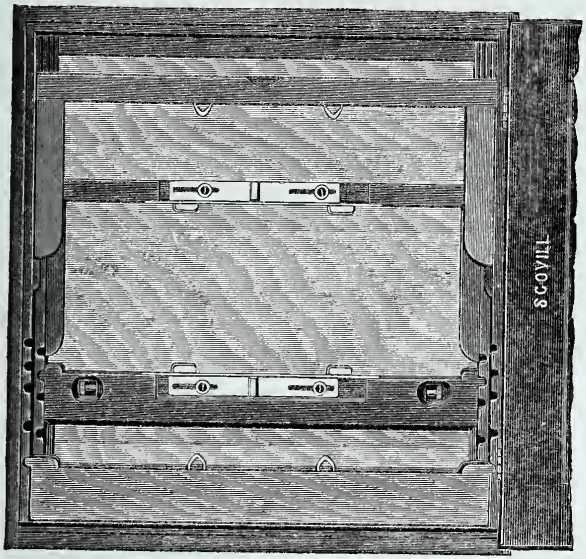
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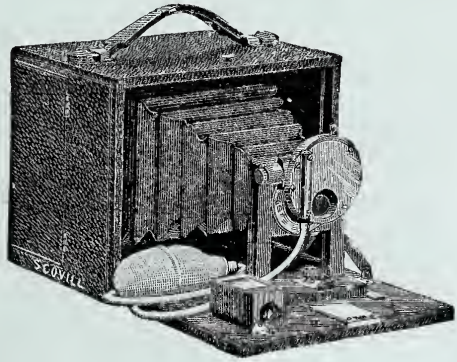
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With Three (3) Double Plate-holders.
An excellent Lens, with
*NEW* Safety Shutter.
Reversible View Finder,
Rising Front and Swing Front.
Leather Covered.

BEST FOLDING CAMERA FOR THE MONEY IN THE COUNTRY.

**Price, Complete, only 15 Dollars.**

---

MADE BY

THE AMERICAN OPTICAL COMPANY.

*FOR SALE BY ALL DEALERS*

AND

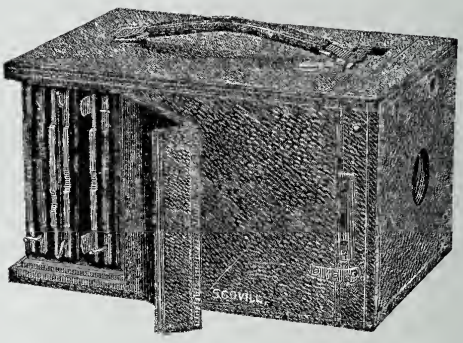
**The Scovill & Adams Company of New York.**

# Scovill's New Waterbury.

The Best

**$15 Hand Camera**

in the market.




A 4 x 5 Hand Camera, with
Three (3) Double Plate-holders,
An excellent Lens, and
New (Safety) Time and Instantaneous Shutter.
A very convenient Focusing Attachment, with
Indicating Plate on Top,
View Finder, etc., etc.
Leather Covered.

**ALL FOR 15 DOLLARS**

MADE BY

THE AMERICAN OPTICAL COMPANY.

*FOR SALE BY ALL DEALERS*

AND

**The Scovill & Adams Company of New York.**

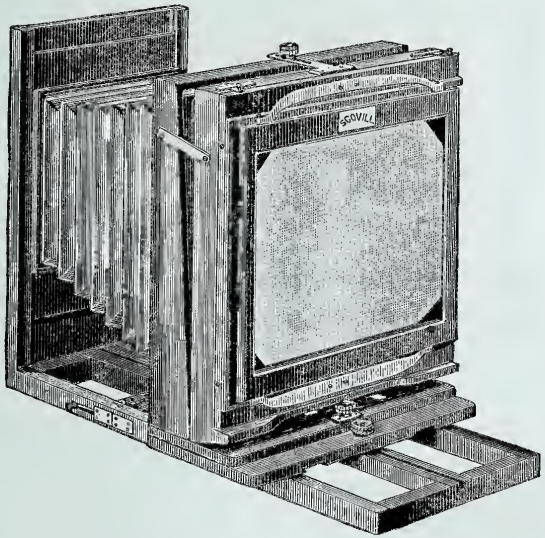
# A NEW CAMERA.

# "The Reversible Landscape,"

**Made by the AMERICAN OPTICAL CO.,**

**To meet the demand for high-grade apparatus at popular prices.**

This Camera is made of highly polished mahogany, with all the latest improvements, and patent self-adjusting ground glass frame, reversible back and rising front.




**. . PRICES. . .**

| | | | | |
|---|---|---|---|---|
| 6½ x 8½ | Double Swing, | - - - - | | $23 00 |
| 8 x 10 | " | " | - - - - | 25 00 |
| 11 x 14 | " | " | - - - - | 35 00 |
| 14 x 17 | " | " | - - - - | 50 00 |

**- - FOR SALE BY ALL DEALERS - -**

AND

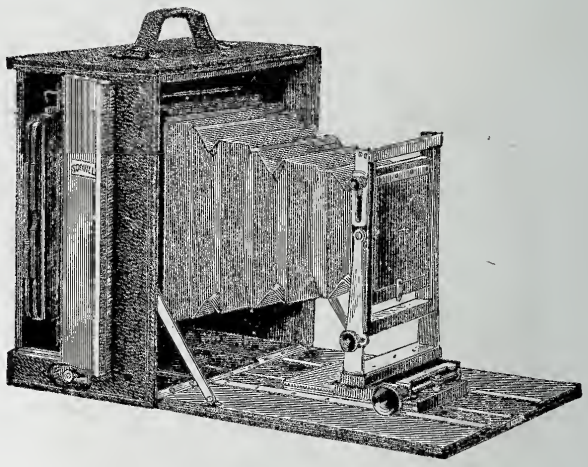
## The Scovill and Adams Company of New York.

# "A Fin de Siècle" Camera.

The end of this century is marked by many useful inventions, among them is the new . . . . . .

# IRVING-CLAY CAMERA

**Manufactured by THE AMERICAN OPTICAL CO.**



This Camera is a combination of the best features of the well-known "Henry Clay" and "Irving" Cameras, and is, therefore, the only Hand and Tripod Folding Camera with **reversible self-adjusting spring back,** and the other features characteristic of these two Cameras.

. . PRICE. . .

| | |
|---|---|
| Size, 6½x8½, with two (2) double holders, - - $45 00 | Size, 8 x 10, with two (2) double holders, - - $50 00 |

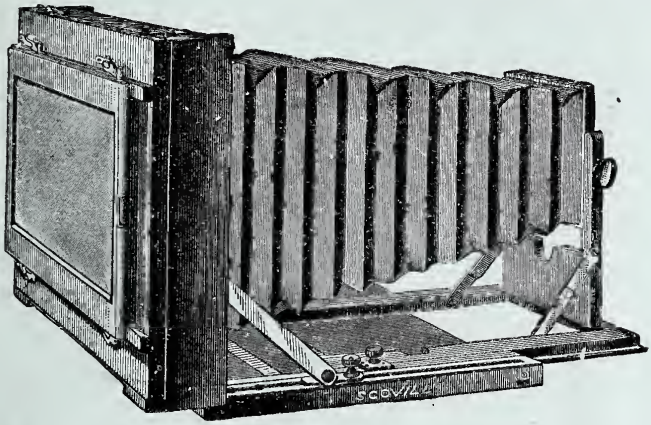
**- - FOR SALE BY ALL DEALERS - -**

AND

## The Scovill & Adams Company of New York.

# IRVING VIEW CAMERAS.

The IRVING Camera recently introduced by the American Optical Co. was awarded the highest prize by the judges at the American Institute Fair. They expressed themselves as unable to see how a more complete, compact, light, handsome and serviceable camera could be made.



The Irving Cameras all have swing front in addition to swing back, vertical shifting front board. They have the Howe patent reversible back, fitted with self-locking ground-glass frame, and when desired, celluloid is used in place of glass for the focusing screen.

One of the best features of the camera is the absence of detachable screws. An idea of this is conveyed by the illustrations showing the camera when extended and when folded.




A superb canvas case, the finest ever made, is supplied with each one of the Irving Cameras. Price list is as follows:

| | Single Swing. | Double Swing. |
|---|---|---|
| 4 x 5 | $27.00 | $32.00 |
| 5 x 7 | 33.00 | 38.00 |
| 5 x 8 | 35.00 | 40.00 |
| 6½ x 8½ | 40.00 | 45.00 |
| 8 x 10 | 45 00 | 50.00 |
| 10 x 12 | 60.00 | $65.00 |
| 11 x 14 | 65.00 | 70 00 |
| 14 x 17 | 75.00 | 80.00 |
| 17 x 20 | 85.00 | 90.00 |
| 18 x 22 | 95.00 | 100.00 |

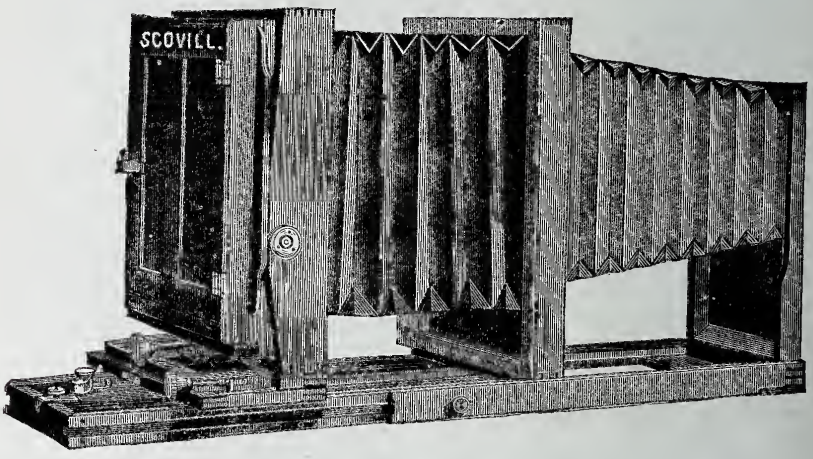
In order to convey an idea of the lightness of these cameras, it is sufficient to say that the 5 x 8 size camera weighs only 3 lbs.

**For Sale by all Dealers in Photographic Materials and The Scovill & Adams Company.**

# THE AMERICAN OPTICAL CO.'S

## UNRIVALED

# PORTRAIT CAMERAS.




The American Optical Company Portrait Cameras are manufactured from the best mahogany, French polished, and have the Lever Focusing Attachment, by which the most delicate focus can be adjusted with the utmost facility and ease. Above 10 x 12 size, they have double bellows, vertical shifting front, the V-shaped wooden guide, and telescopic platform.

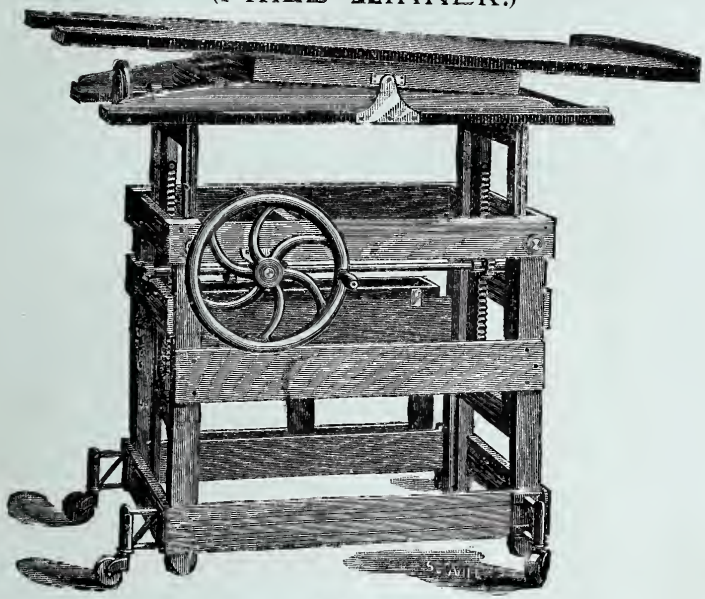
| No. | Size. | | | | | | With Double Swing-back. |
|---|---|---|---|---|---|---|---|
| 5— | 8x10 ins., | with rigid | platform | 30 ins. | long | ..... | $38 00 |
| 6— | 10x12 " | " " | " | 36 | " | ..... | 48 00 |
| 7— | 11x14 " | extension | " | 48 | " | double bellows and vertical shifting front, | 64 00 |
| 8— | 12x15 " | " | " | 48 | " | " | 72 00 |
| 9— | 14x17 " | " | " | 60 | " | " | 76 00 |
| 10— | 16x20 " | " | " | 65 | " | " | 88 00 |
| 11— | 17x20 " | " | " | 65 | " | " | 90 00 |
| 12— | 18x22 " | " | " | 70 | " | " | 100 00 |
| 13— | 20x24 " | " | " | 72 | " | " | 110 00 |
| 14— | 22x27 " | " | " | 72 | " | " | 130 00 |
| 15— | 25x30 " | " | " | 80 | " | " | 170 00 |

**Buy from Dealers or the Scovill & Adams Company.**

THE

# "ELITE" STUDIO STAND.

(PRIZE WINNER.)



Patented.

These are the only Stands suited in workmanship and finish, also in size, to the large American Optical Co.'s Cameras, with their great length of bellows and extension platform. Practical portraitists cannot fail to admire the ease with which these stands can be adjusted at any desirable height or inclination, and the nciseless manner in which they may be moved from place to place, their elegant appearance and accurate construction.

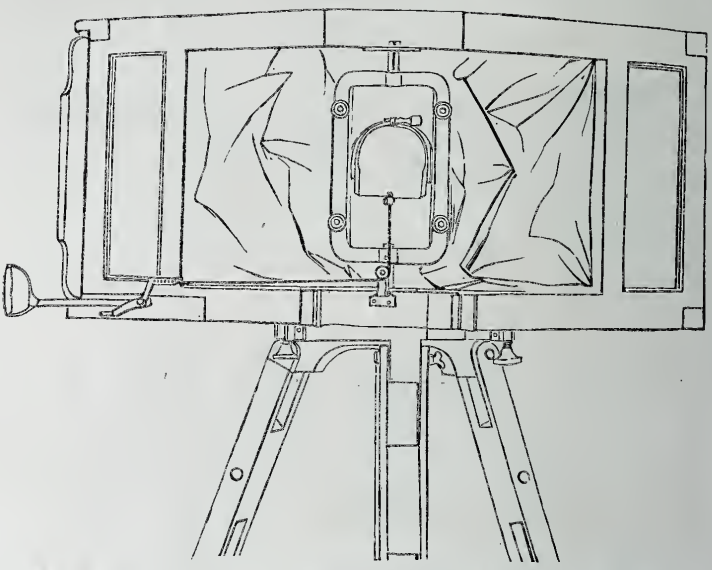
Instead of the clumsy levers and racks, by which accurate adjustment of the platform was obtained in the older stands; the proper elevation and inclination are produced in the "Elite" stand by cog-wheel and snake screw, and the manipulation at one side by a wheel with handle, and within reach of the operator, so that he may adjust the height or inclination of this camera without taking his head from under the focusing cloth. By means of the wheel worked at the rear end of the platform, the horizontal position of the platform may be inclined upward or downward to a limit of 15 degrees. A great advantage from this movement, we observe, is that a true horizontal position—so difficult to obtain in the old camera stands—is, with these, an easy matter to effect. This is especially important to those who may use them for reproduction work. In the No. 2 size the platform is fifty-two inches long and twenty-five inches wide, and its length may be increased to seventy inches by an attachment which slides out forward, making it quite long enough for supporting a large copying camera. Then a semi-circular cut-out, to the rear end of the platform, is a convenience to the operator, who is thus enabled not only to stand closely up to the ground glass, no matter how far the camera may have been pushed forward, but bending of the body is obviated, which is quite a necessity with all the older stands.

## "ELITE" STUDIO STANDS

| | No. 1 Size. | No. 2 Size |
|---|---|---|
| PRICE, with Rack and extension for Plate Holder | $32.00 | $36.00 |
| Highest point from platform to floor | 48 | 48 |
| Lowest " " " " " | 32 | 32 |
| Width of platform | 22 | 26 |
| Length of platform without attachment | 45 | 52 |
| " " with " | 60 | 70 |

**For Sale by all Dealers in Photographic Materials and The Scovill & Adams Company.**

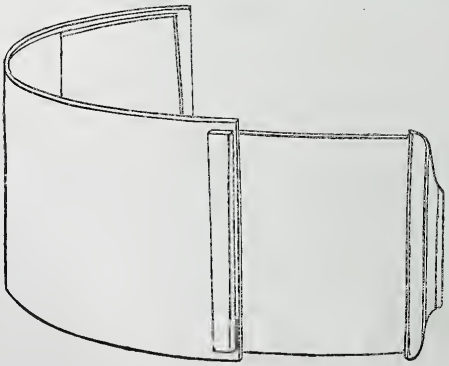
# The Scovill Panoramic Camera.



WE take pleasure in introducing to the photographic fraternity our new Panoramic Camera, which is made in various dimensions up to the size capable of making photographs 18 x 48 inches.

A new design of constructing these cameras in hemispherical form has been invented; a new movement of crossing the lens over the segments of the circle, and an automatic release for the shutter has also been constructed. Carbutt's No. 27 films, or his orthochromatic films of the same sensitiveness, are used by means of an ingeniously constructed flexible dark slide, which permits of the necessary curve to conform with the back of the camera. The cameras are solidly and serviceably made, elegant in finish, and in every way maintain the world-wide reputation of the American Optical Company. The cuts shown herewith give an idea of the external appearance of the camera, and the dark slide for holding the film.

The prices of these cameras, including in each case a substantial wooden box or trunk for holding the instrument, a suitable tripod, a panoramic printing frame, two holders, two developing baths, and the celebrated Swift lens, are given below.



**Price of The Scovill Panoramic Outfit for making photographs 10x30 inches, complete as above, - - - - $250**

**Price of The Scovill Panoramic Outfit for making photographs 16x43 inches, complete as above, - - - - 300**

THE

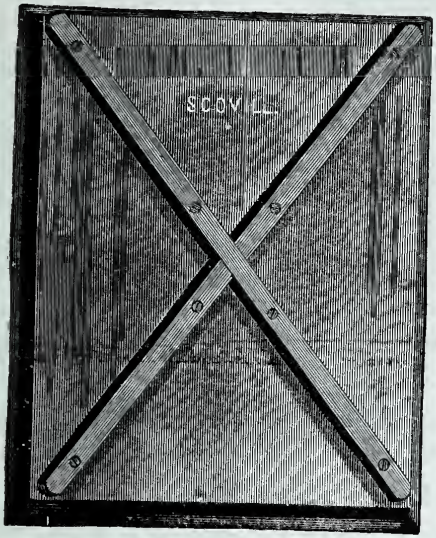
SCOVILL & ADAMS COMPANY,

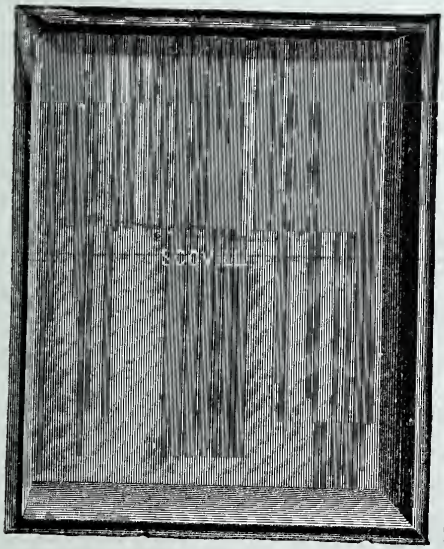
423 Broome Street,

New York City.

# FOR SILVERING,

## THE WATERBURY TRAYS ARE THE BEST AND CHEAPEST.



These Trays are made by the

**AMERICAN OPTICAL CO.**

which of itself is a guarantee of the superiority of the wood-work.

Canvas is not required for the seams, as the bottoms are seamless. The bottom rests on cross-strips—a great improvement, for steadiness, over knobs at the corners, which were liable to be broken off.

THE

**Waterbury Trays**

are guaranteed not to warp or crack.

### PRICE LIST.

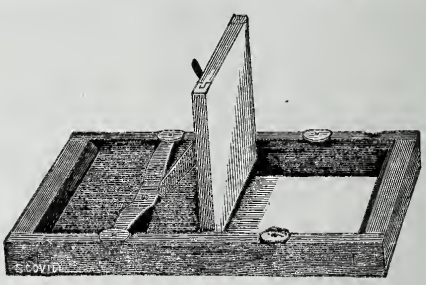
| | | | Each. |
|---|---|---|---|
| 15x19 | Waterbury | Trays..... | $3 50 |
| 19x24 | " | " ..... | 5 00 |
| 22x28 | " | " ..... | 6 50 |
| 25x30 | " | " ..... | 9 00 |

For Sale by all Dealers in Photographic Requisites, and by

**THE SCOVILL & ADAMS COMPANY.**

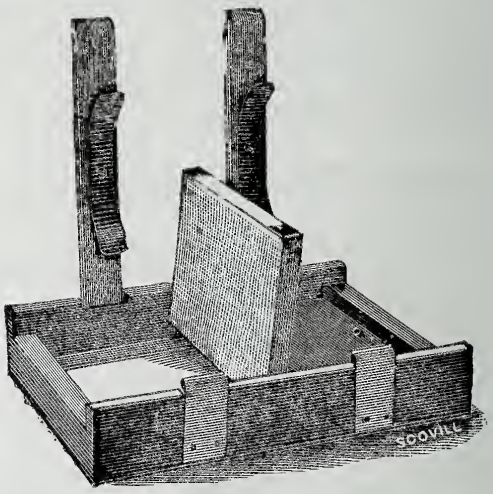
# Scovill Printing Frames.

**Manufactured of Cherry, with Brass Springs, Paneled Backs and Tally.**




Scovill Flat Printing Frame (Open).

Our Printing Frames are constructed so that a uniform pressure is obtained, thus insuring perfect contact between the positive paper and negative plate. The back-boards are so arranged that the progress of the printing may be watched without danger of shifting the paper.




Scovill Deep Printing Frame (Open).

| For Plates | Flat. | Deep. |
|---|---|---|
| 3¼ x 4¼ | $0 36 | $0 75 |
| 4 x 5 | 38 | 75 |
| 4¼ x 5½ | 40 | 75 |
| 4¼ x 6½ | 42 | 85 |
| 5 x 7 | 50 | 85 |
| 5 x 8 | 52 | 1 00 |
| 6½ x 8½ | 60 | 1 25 |
| 8 x 10 | 75 | 1 50 |
| 10 x 12 | 1 00 | 1 75 |
| 11 x 14 | 1 85 | 2 50 |

| For Plates | Flat. | Deep. |
|---|---|---|
| 13 x 16 | $2 05 | $2 75 |
| 14 x 17 | 2 45 | 3 00 |
| 16 x 20 | 3 10 | 4 25 |
| 17 x 20 | 3 30 | 4 60 |
| 18 x 22 | 4 20 | 5 20 |
| 20 x 24 | 5 10 | 5 50 |
| 24 x 30 | .. | 9 00 |
| 35 x 45 | .. | 16 00 |
| 30 x 60* | .. | 22 00 |

*Larger or special sizes made to order at short notice, according to specification.

When made with backs to open lengthwise, ten per cent. is added to the foregoing prices for the respective sizes.

# A Page of Specialties

MANUFACTURED BY

# H. A. Hyatt.

**N. E. Cor. 8th and Locust Streets, St. Louis, Mo., U.S.A.**

DEALER IN

## PHOTOGRAPHIC SUPPLIES.

**Hyatt's Stamp Portraits and Apparatus.**
Pat. July 12th, 1887.
Making the only and original stamp portraits, gummed on the back, and perforated like postage stamps. Samples and prices on application.

**Peck's Pneumatic Retoucher**
Pat. March 26th, 1895.
The only practical retouching machine in the market.
Uses **air as a motive force.** The pencil **weighs but half an ounce.** Write for particulars.



## Three Vignetters

**Kuhn's New Magic Vignetter**—For black Backgrounds and Platino effects.
**Kuhn's Improved Vignetting Attachment**—For Vignetting the Negative.
**The Dixie Vignetters**—For Vignetting the Print.

**Columbian Incandescent Ruby Electric Lamps**—For illuminating the Dark Room. An absolutely safe light for the purpose.

**The Mound City Gasoline Burnisher Heater**—For all sizes. No smoke, smell or dirt.

**Hyatt's New Rival Lenses**—For Portraits and Views. Wide Angle and Wide Angle Portable Symmetrical Rival Lenses. Best in the world for interiors and architectural work.

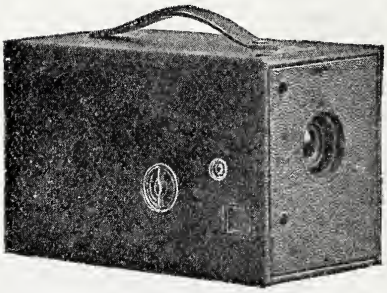
**Hazenstab's Studies in Photography, Lighting, Posing and Grouping,** and **Hazenstab's Simplicity on Retouching** should be in the hands of every photographer.

**Our Catalogues, Booklets, Circulars, Etc.,** describing all of the above Specialties, and containing descriptions, illustrations and prices of every Photographic Requisite, will be mailed to any address on receipt of ten cents in stamps to prepay the postage.

*Address*_____

**H. A. HYATT, N.E. Cor. 8th & Locust Sts., St. Louis, Mo., U.S.A.**

# THE SUNART



## Magazine Camera :

5 STYLES.

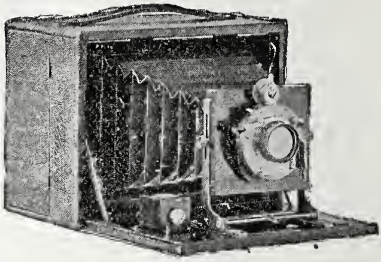
Price from

**$25 to $45.**

The only practical Magazine Camera. Holds 24 cut sheet films, 4 x 5 inches, already loaded in carriers for you. Films guaranteed.

"Veni!" "Vidi!" "Vici!"

## SUNART ~ Folding ~ Camera



All Sizes, from 4 x 5, 5 x 7, 6½ x 8½.

*Ranging in price from* **$20.00 to $75.00.**

The smallest up-to-date Folding Camera. Will carry three double plate-holders for glass or roll holder, for 48 exposures on films. First-class Lenses and Shutters guaranteed. The finest grade of workmanship.

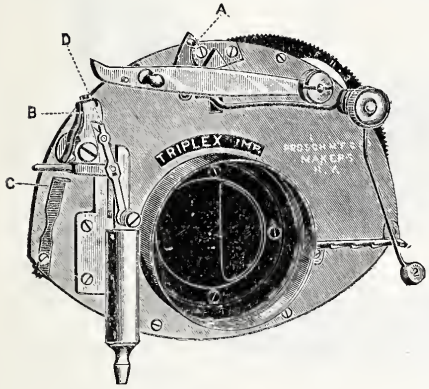
SEND FOR CATALOGUE.

**SUNART PHOTO CO.**

For sale by all Photo Stock Dealers.

Rochester, N. Y., U. S. A.

# The TRIPLEX
## Improved Shutter




For neatness, simplicity, certainty of operation, correct construction according to optical requirements, and **Range of Speed,** is the very ideal of what a Shutter should be. Many have pronounced it the "**Ne Plus Ultra**" of shutter construction.

***Price, $12.50 up.***

## *Have you failed*

To stop even **slight** motion with some shutter with a speed indicator marked up to $\frac{1}{100}$ sec.? Would not a test of such a shutter show it was not even **half** as fast as pretended? **The TRIPLEX, Imp.** does what its **SPEED Card claims;** works to $\frac{1}{150}$ of a second, **every gradation less,** and has **TIME** movement.

## *FLASH LAMPS*

***ARE NOW IN SEASON.***

**Lightning Storage Lamp** (from Dec. 1st), - - **$4.50**
**Professional Storage Lamp,** " " - - - **9.00**

The Lightning, or "Prosch Lamp" is well known for effective work. Professional, TWICE its size. Just the thing for large and mine work. These Lamps are the most powerful *portable* flash devices made.

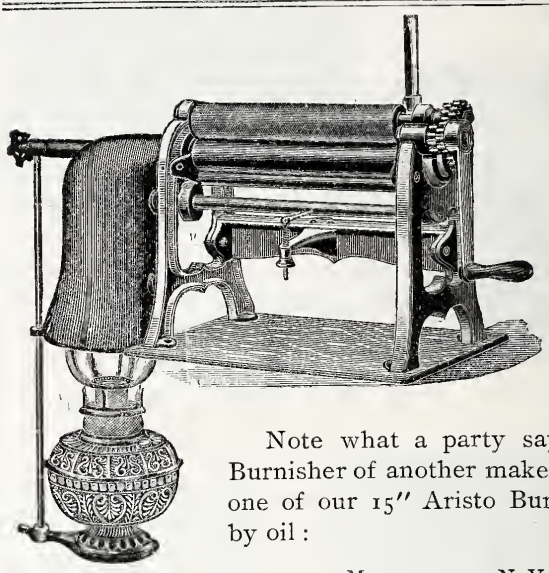
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**Our Catalogue, mailed FREE, will interest you.**

***PROSCH MFG. CO.***

***389 Broome Street, New York.***

# Acme Burnishers.



Note what a party says who had a Burnisher of another make and purchased one of our 15″ Aristo Burnishers heated by oil :

MIDDLEBURGH, N. Y., April 23, 1895.

ACME BURNISHER CO.

GENTLEMEN : I tried my new Burnisher yesterday and find it to be all you claim for it. It is decidedly the finest and does the best work of any Burnisher I have ever used, and I have been in the Photograph business for twenty-eight years, and in that time I have tried about all of the different makes. The lamp heating attachment is great. It heats quick and is very easy to handle.

Yours very respectfully,

J. W. RICHIE.

This speaks for itself. The Acme Aristo Burnisher gives the best gloss and is the simplest Burnisher made and is the only hollow roll Burnisher made that can be heated by oil, gas or gasoline.

Remember it is fully guaranteed. Give the Acme Aristo a trial and be convinced as others have been.

***Ask your Dealer for New Catalogue.***

ACME BURNISHER CO.

**FULTON, N. Y.**

# CARBON AND PLATINUM PAPERS.

My specialty since 1889. If you don't know about them, or have not tried mine, send 2c. stamp for instructions and price list.

## N. Y. DEVELOPING POWDERS.

$1.00 per box. Unexcelled for plates, bromide paper and transparencies.

## MYTRYLYN DEVELOPER.

A most perfect combination of several of the more recent phenols. Material for ONE GALLON (can be dissolved in 1 qt. water) sent, post-paid, for $1.50.
None Better! None Nearly so Cheap! TRY IT!

## CAMERAS, LENSES, General Photo Supplies.

Catalogue of any make cheerfully sent. Rochester Optical Co.'s Apparatus a specialty.

Those wishing a specially fine lens will be interested in the new **ROSS GOERTZ**, Series III. It will take snap shots on dull days, and give full detail. Catalogue free. Lenses *on approval* to parties known to me or furnishing suitable references.

## BACKGROUNDS at reasonable prices.

## PROMPT SHIPPING.

Situated close to all Express Companies and Post Office. Goods are shipped one hour after receipt of order.

**Correspondence Solicited.** **Inquiries Cheerfully Answered.**

Manufacturers of Photo Novelties please send Samples and Prices.

EDWARD W. NEWCOMB,

PHOTOGRAPHIC : APPARATUS : SUPPLIES,

69 West 36th Street. N. Y. City.

# MAX LEVY'S

# Perfected Engraved Gratings

FOR THE

## *Half-tone Process.*

Patented in the United States and England, Feb. 21, 1893.

**Original Rulings, Engraved Lines,**

PERFECTLY BLACK LINES,
PERFECTLY TRANSPARENT SPACES,
PERFECTLY SHARP EDGES.

**THE ONLY PERFECT APPLIANCE FOR MAKING HALF-TONE NEGATIVES.**

Over **2,000** in use in the best establishments throughout the world.

All Sizes, from 3¼ x 4½ to 32 x 38 inches.

All Rulings, from 50 to 300 lines per inch.

MANUFACTURED BY

## MAX LEVY,

**1213 Race Street, Philadelphia, Pa., U.S.A.**

**Illustrated Price List on Application.**

*FOREIGN SELLING AGENCIES:*

LONDON—Penrose & Co., 5 Amwell Street.
PARIS—H. Le Soudier, 174 Boulevard St. Germain.
FRANKFORT A/M—Fr. Hemsath, Röderbergweg, 135.

---

### *A New Combination Screen.*

Patented in the United States, June 19, 1894. Patented in the leading countries.

---

Descriptive Circular ready about December 1, 1895, and will be mailed only to interested parties, on request.

## We have them Both!

# ANDRESEN'S AMIDOL.

The Finest Developer yet Introduced.
Most Energetic and Powerful.
In Use by Leading Photographers.

(See Testimonials in the PHOTOGRAPHIC TIMES.)

**ALSO**

# HAUFF'S AMIDOL.

Which is esteemed even higher by its admirers.

If you are not using one of these AMIDOL DEVELOPERS send for a sample at once.

## PRICE LIST.

(THE SAME FOR BOTH.)

| | |
|---|---|
| In 1 ounce Packages | $0.75 |
| " 2 " " (Hauff's) | 1.50 |
| " ¼ pound " | 2.75 |
| " ½ " " | 5.25 |
| " 1 " " | 10.00 |

Amidol Cartridges (Andresen's) making 16 ounces of Developer.

| | |
|---|---|
| In Packages of 5 | $1.00 |
| " " " 10 | 2.00 |
| " " " 6, AMIDOL CARTRIDGES (Hauff's) | 1.20 |

FOR SALE BY ALL DEALERS IN PHOTOGRAPHIC GOODS
AND THE SOLE IMPORTERS

## THE SCOVILL & ADAMS COMPANY,

423 Broome Street, NEW YORK.

# The Scovill Prepared Solutions, Powders, Etc.

**S. P. C. Retouching Fluid.** (For Varnished and Unvarnished Negatives.) Per bottle, . . . . . $0 25

**Magnesium Flash Compound.** Oz. bottle, . . 50

**Hall's Intensifier.** (For strengthening weak Negatives.) Per bottle, . . . . . 75




**S. P. C. Negative Varnish.** Per bottle, . . . 35

**French Azotate.** (For toning Prints.) Per bottle, . 25

**Kristaline Varnish.** Per bottle, . . . . 40

**S. P. C. Orthochromatic Solutions.** By which any Plate may be rendered color-sensitive. Per package, . 1 50

**The Columbian Developer.** Complete in one solution. For quick exposures. Per bottle, . . . . . 30

**J. C. Tabloid's.** Enough to develop eight to twelve dozen 4 x 5 plates, . . . . . 75

**Wyeth's Compressed Photographic Tablets.** Complete equipment for developing, toning and fixing, . 3 00

**Wyeth's Compressed Tablets.** Developing outfit, 1 75

**Wyeth's Compressed Tablets.** Print-toning outfit, . 1 75

Prices of separate bottles of 100 tablets each :

| | | | |
|---|---|---|---|
| No. 1 | $0 75 | No. 5 | $1 50 |
| No. 2 | 30 | No. 6 | 18 |
| No. 3 | 40 | No. 7 | 35 |
| No. 4 | 35 | No. 8 | 25 |

**Pelletone** (Pyro-acid Tablets). One bottle containing 100 tablets of 2 grains each, . . . . . 40

**Woodbury Antipyr.** An improved concentrated hardener for Gelatine Plates or Prints. Per bottle, . . . 75

**S. P. C. Acid Fixing and Hardening Compound.** For Negatives, Transparencies, Lantern Slides and Bromide Paper. In one pound package, . . . . . 25
In one-half pound package, . . . . . 15

***Buy from Dealers or the Scovill & Adams Company.***

# The Scovill Prepared Solutions, Powders, Etc.




## JUST INTRODUCED.

**S. P. C. Eikoquinole Developer.** Per bottle, . . $0 35

**S. P. C. Eikonogen Developer.** Per package, . 75

**S. P. C. Pyro and Soda Developer.** Per package, . 60

**S. P. C. Pyro and Potash Developer.** Per package, 60

**S. P. C. Hydrochinon Developer.** Per package, . 60

**S. P. C. Bromide Paper Developer.** Set, . . 75

**S. P. C. Restrainer.** In accurate dropping bottle, . 50




**S. P. C. Clarifying Solution.** Per bottle, . . 50

**S. P. C. Reducing Solution.** Small bottle, . . 50

Large bottle, . . . . . 75

Reduces density in negatives and positives on glass or paper. Can be applied locally to remove halation marks, ghosts, etc.

**S. P. C. Hypo Eliminator.** (For removing every trace of Hyposulphite of Soda from Negatives and Prints.) Per bottle, with book of testing paper, . . . 50

***Buy from Dealers or the Scovill & Adams Company.***

# A GREAT ADVANCE!

# WYETH'S COMPRESSED TABLETS OF PHOTOGRAPHIC CHEMICALS

**A Compact and Complete Equipment of Adjusted and Accurately Prepared Photographic Chemicals in the Form of Compressed Tablets, for the Extemporaneous Preparation of the Various Solutions Used and Required to Develop and Fix Plates and to Tone and Fix Prints.**

**No Necessity for Scales. Dry and Portable.**

**No Waste or Deterioration of Solutions.**

The complete Case contains the following Tablets, with full instructions on each bottle for preparing the solutions

No. 1. DEVELOPING—PYRO.
(Composed of Sulphite of Soda, Acid Pyrogallic, Acid Citric.)

No. 2. DEVELOPING—SODA.
(Composed of Sulphite of Soda, Carb. Soda and Carb. Potash.)

Nos. 1 and 2 when mixed, as directed on the label, constitute the "Developing Solution," or, as sometimes called, "Developer."

No. 3. FIXING AND CLEARING.
(Composed of Sulphite of Soda, Acid Citric, Chrome Alum.)

No. 4. FIXING AND CLEARING.
(Consists of Hyposulphite of Soda.)

Nos. 3 and 4, when mixed, according to instructions on the label, make the Fixing and Clearing Bath, which can be kept for stock solution if so desired.

No. 5. TONING FOR PRINTS—GOLD CHLORIDE.

No. 6. TONING FOR PRINTS—SODA.

Nos. 5 and 6 constitute the Toning Bath; this must be alkaline.

No. 7. PRINT FIXING—HYPOSULPHITE OF SODA.
This can also be used advantageously for stock solution, a few drops of Aqua Ammonia greatly enhancing its value.

No. 8. BROMIDE OF POTASH.
For checking the too rapid development of over-exposed plates.

Any of the above Tablets can also be procured separately.

## Price for Complete Equipment, $3.00.

The **Developing Outfit** containing the following Tablets, with full instructions on each bottle for preparing the solutions:

No. 1. DEVELOPING—PYRO.
(Composed of Sulphite of Soda, Acid Pyrogallic, Acid Citric.)

No. 2. DEVELOPING—SODA.
(Composed of Sulphite of Soda, Carb. Soda and Carb. Potash.)

No. 3. FIXING AND CLEARING.
(Composed of Sulphite of Soda, Acid Citric and Chrome Alum.)

No. 4. FIXING AND CLEARING.
(Consists of Hyposulphite of Soda.)

No. 8. BROMIDE OF POTASH.
For checking the too rapid development of over-exposed plates.

Our Nos. 1 and 2 Developing Tablets are so prepared that those who are in the habit of immersing the plates with Pyro solution first and then adding the Soda, can do so. Our formulas Nos. 3 and 4, for Fixing and Clearing, are of such combination that we dispense entirely with the Alum Bath, thus requiring only two trays to develop and fix the plate.

## Price for Developing Outfit, $1.75.

The **Print Toning Outfit** contains the following Tablets, with full instructions on each bottle for preparing the solutions:

No. 5. TONING FOR PRINTS—GOLD CHLORIDE.

No. 6. TONING FOR PRINTS—SODA.

Nos. 5 and 6 constitute the Toning Bath; this must be alkaline.

No. 7. PRINT FIXING—HYPOSULPHITE OF SODA.
This can also be used advantageously for stock solution, a few drops of Aqua Ammonia greatly enhancing its value.

Any of the above can also be secured separately in bottles of 100 tablets each.

## Price for Print Toning Outfit, $1.75.

***Explicit Instructions will be found in the General Pamphlet contained in each outfit.***

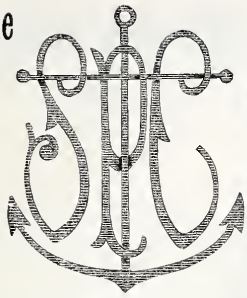
Prices of Separate Bottles of 100 Tablets each:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| No. 1 | $0.75 | No. 3 | $0.40 | No. 5 | $1.50 | No. 7 | $0.35 |
| No. 2 | 30 | No. 4 | 35 | No. 6 | 18 | No. 8 | 25 |

For sale by all Dealers in Photographic Goods, and

THE SCOVILL & ADAMS COMPANY.

The



Something New! Just Out!

# Acid Fixing AND Hardening Compound

FOR

## Negatives, Transparencies, Lantern-Slides and Bromide Paper.

DESTROYS ALL DEVELOPING FOG AND YIELDS PECULIARLY BEAUTIFUL AND PERMANENT RESULTS.

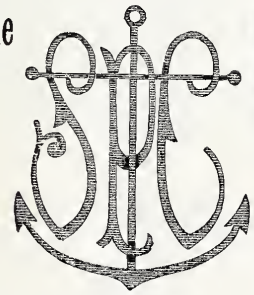
This solution can be used repeatedly, so long as it fixes. It can also be used as a reducer of over density by a long continued treatment.

Price, in one lb. packages, only 25 cts. In one-half lb. packages, only 15 cts.

FOR SALE BY ALL DEALERS.

---

The



# Woodbury Antipyr.

AN

## Improved Concentrated Hardener

FOR

## GELATINE · PLATES · AND · PRINTS.

Mix one ounce of this solution with ten ounces of water and soak the plate or print therein for from six to ten minutes. Then rinse off and dry. The plate or print thus treated will withstand a heat exceeding 100° F. This solution may be used repeatedly.

**Price per bottle, 75 cents.**

**FOR SALE BY ALL DEALERS.**

# THE ALBION TRIPOD.

This is the most elegant Tripod ever introduced. It is adapted to and is firm enough to support without vibration any View Camera from 5 x 7 to 10 x 12 size, inclusive.



The Legs of this Tripod are adjustable as to length, and may be quickly folded. As the binding straps are attached, they are always in place when wanted.

The artistic design and faultless finish of every portion of this Tripod cannot be realized without seeing one, and to use an ALBION TRIPOD means to be fully satisfied, and wish for none other.

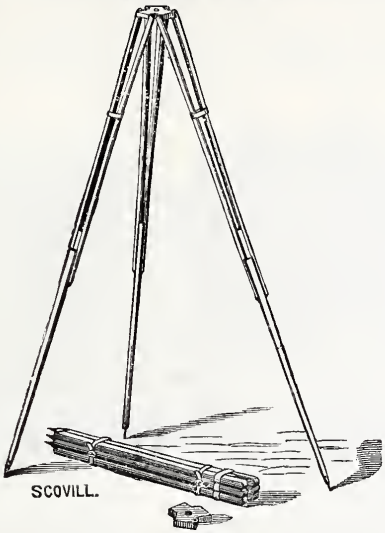



No. 1, Cherry wood..... $4 50
No. 2, " " ..... 6 00
No. 3, Spruce (very light), price..... 6 00

**For Sale by all Dealers in Photographic Materials and The Scovill & Adams Company.**

# The Scovill Adjustable Tripod.

(FEATHER WEIGHT.)

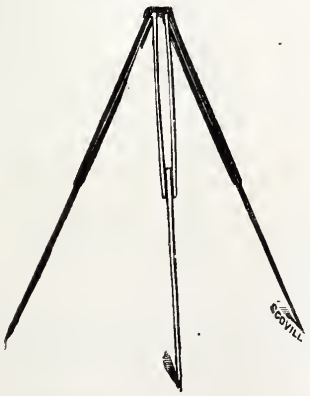



Nothing more compact, certainly nothing as graceful in appearance and light in weight as the new Tripod for out-door Photography, just produced by the American Optical Company, has yet made its appearance. Because so readily adjusted to the utmost irregularity of the earth's surface, it was decided to call it the "Adjustable Tripod." Lady amateurs prefer it to any other pattern on account of its lightness and beauty. The top is covered with billiard-cloth to prevent marring the fine polish on our cameras, and the clamping screws are not detachable.

**SCOVILL ADJUSTABLE TRIPOD.**

No. 1..... Price, each, $3.50
" 2..... " " 5.00

**Scovill Adjustable Jointed Tripod,** to fold and pack in a 22-inch Valise..... $4.00
Do. with Canvas Bag and Handle.. 4.75



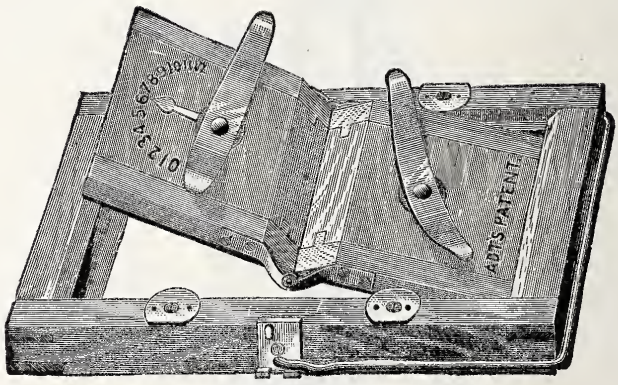

**THE IMPROVED TAYLOR TRIPOD.**

The illustration here presented makes an extended description unnecessary. Suffice it to say that this tripod is very firm when set up, and folds up compactly by simply pressing together the two upper joints of each leg, thus unsetting them from the pins on the brass top and then doubling them over on to the third joint. This movement is naturally reversed when placing the tripod in position to support the camera.

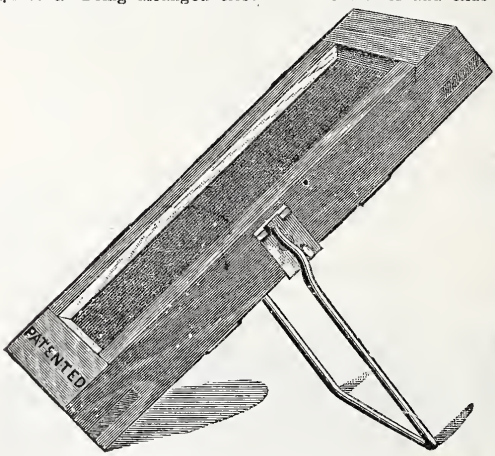
Price, with metal disc and non-detachable screw.....$2.25 each.

Adapted for cameras from 1-4 to 8x10 size.

# ADT'S PATENT PRINTING FRAMES.




These Frames are now supplied (without extra charge) with Adt's Patent Support with which the frame can be stood on either end, and at four different angles, for exposure while printing. It is out of the way of the printer when introducing the paper, or examining the print, for when the frame lies or is held with back up, the support instantly drops upon its stops for rest, and is entirely out of the way of the hand of the printer, so that he may remove or open the back-board, or replace it, as if there were no support present. Being arranged close around the sides and ends of the frame, it occupies so little space as not to interfere with the packing or storage of the frames, and when the printer places his frame for exposure the support readily finds its position for supporting the frame without any special manipulation.




**PRICES.**

| | |
|---|---|
| 3¼ x 4¼ | $0 50 |
| 4 x 5 | 50 |
| 4¼ x 5½ | 50 |
| 4¼ x 6½ | 60 |
| 5 x 7 | 65 |
| 5 x 8 | 65 |
| 6½ x 8½ | 75 |
| 8 x10 | 85 |
| 10 x12 | 1 15 |
| 11 x14 | 2 15 |
| 13 x16 | 2 40 |
| 14 x17 | 2 80 |

When made with back to open lengthways, an additional charge of 10 per cent. will be added to the above prices.

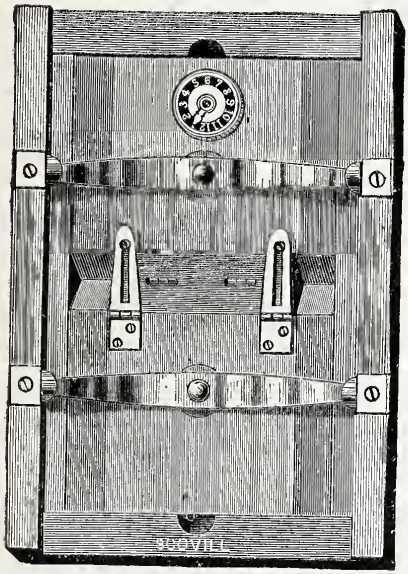
As will be seen by a glance at the cut, the adjacent edges of the parts of the back-board are beveled outward, and the hinges placed on the sides with their axes on a line with the surface. This permits the attachment to the face of the back-board of a **Heavy, Continuous Elastic Felt Pad.** This obviates the necessity of using a separate pad, which is so easily misplaced and lost.

**For Sale by all Dealers in Photographic Materials and The Scovill & Adams Company.**

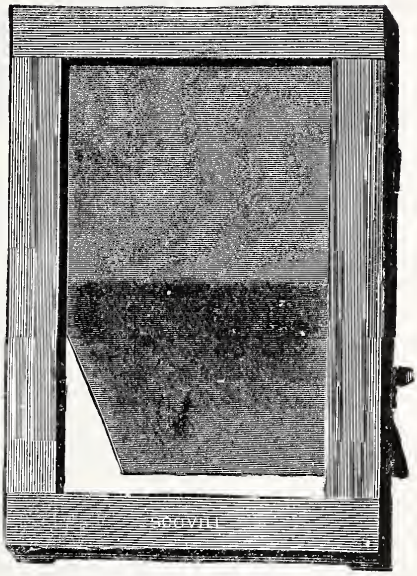
# IRVING PRINTING FRAMES

## WITH ADJUSTABLE SUPPORTS.

(PATENTED.)



IRVING PRINTING FRAME, CLOSED
FRONT VIEW.



IRVING PRINTING FRAME, OPEN.
BACK VIEW.

The IRVING FRAMES have valuable features which cannot be copied. They are in workmanship, design, and other respects, superior to all other printing frames.

The continuous felt pads made especially to order for us, insure absolute protection and uniform pressure throughout. The Irving Patent Catches lock the back, so that when one flap is open there is not the slightest danger of the flaps, paper or negative slipping.

The springs are cut by dies of specially tempered and tested metal, and are riveted to the backs with washers underneath to protect the woodwork.

The IRVING FRAMES are made of cherry guaranteed not to warp or crack.

The tally does not depend upon any other part of the frame to lock it, for the pointer will remain in place no matter what is done to other parts of the frame.

### Prices for Half or Two-thirds Opening Styles.

| | | | |
|---|---|---|---|
| 3¼ x 4¼ | $ .45 | 5 x 7 | $ .60 |
| 4 x 5 | .48 | 5 x 8 | .65 |
| 4¼ x 5½ | .50 | 6½ x 8½ | .70 |
| 4¼ x 6½ | .55 | 8 x 10 | .80 |

When made with backs to open lengthways, ten per cent. is added to the foregoing prices, for the respective sizes.

**For Sale by all Dealers in Photographic Materials and The Scovill & Adams Company.**

## Time and Instantaneous

For general use.

## Silent Studio

For use when quiet is desired.

## Focal Plane

To take objects having great rapidity of movement.

Range of speed, from $\frac{1}{20}$ to $\frac{1}{1000}$ part of a second.

# THORNTON-PICKARD SHUTTERS

Sole Agents for the United States,

## Andrew J. Lloyd & Co.

OPTICIANS,

323 & 325 Washington Street, Boston.

DEALERS IN PHOTOGRAPHIC SUPPLIES.

Price List and Catalogue on application.

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ESTABLISHED 1869.

# OELSCHLAEGER BROS.

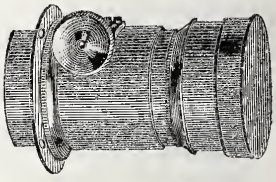
42 East 23d Street, New York.

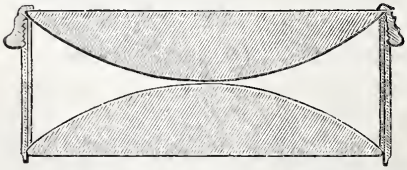
IMPORTERS AND MANUFACTURERS OF **Optical Instruments.**

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MAGIC LANTERNS.

Photographic Lenses and Condensing Lenses and Objectives

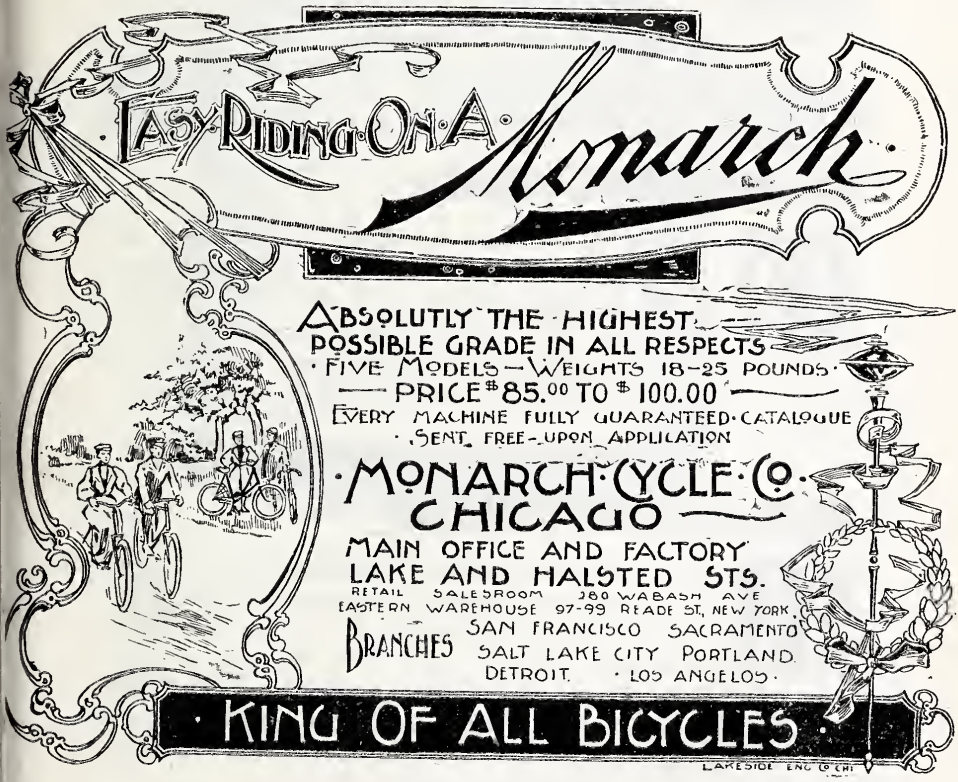
FOR STEREOPTICONS.





Glass FOR MAKING LANTERN SLIDES.

DARLOT LENSES
*A Specialty.*


EASY RIDING ON A Monarch
ABSOLUTLY THE HIGHEST POSSIBLE GRADE IN ALL RESPECTS
FIVE MODELS — WEIGHTS 18-25 POUNDS
PRICE $85.00 TO $100.00
EVERY MACHINE FULLY GUARANTEED CATALOGUE SENT FREE UPON APPLICATION
MONARCH CYCLE CO.
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KING OF ALL BICYCLES
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# Three Up-to-Date Illustrative Methods

COLORITYPE.—Reproduces on paper, in any size and in the exact form, all the varied hues and colors of natural objects, paintings, etc., in marvelous fidelity, by the sun-truth of photography. In effect, this is applied photography in colors. Perfect uniformity is obtained in editions of any size, whether one hundred or one million.

In the Coloritype there is not the loss of the individuality of the artist which occurs in all other practicable color methods.

DUOGRAPH.—Obtains the depth and richness of photogravure, or the sharp and delicate effect of an etching, combined with the soft detail of half-tone. May be printed in any color, and produced from objects, photographs, drawings or engravings. Editions may be of any size; cost far below that of any equivalent process.

This method is a surprise to those unfamiliar with its varied resources, and it is especially suited for effective reproductions of photographs.

HALF-TONE.—Our plates for single-color work are of superlative quality The first in America to make half-tones commercially, we are, to-day, producing the best work. Our processes enable us, further, to obtain good plates from very difficult subjects, which under ordinary treatment would be unsatisfactory. Subjects intelligently considered; prices moderate; delivery prompt.

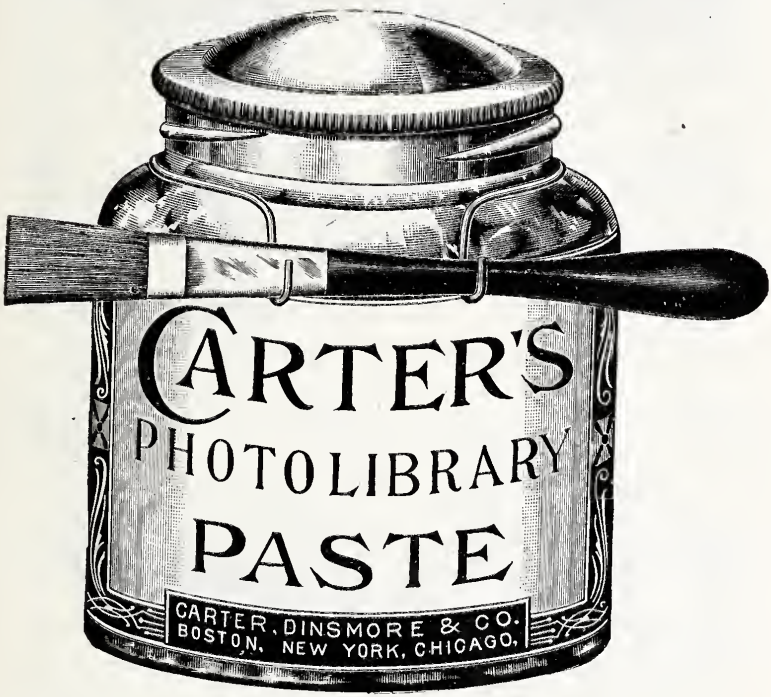
The leading magazines of America have for years used our half-tone plates, and are still our customers.

Samples in any of these advanced methods, with prices, on application to

COLORITYPE COMPANY,

W. KURTZ, President. 32–34 Lafayette Place, New York.

# A New Discovery in Mountants.




It is white, smooth, and sticks like a car window. . . will not cockle, warp or sour, and is uniform and always ready for use.

Glacé Prints mounted smooth with their gloss undimmed.

No pressure needed in mounting Collodion Prints. . . . .

***For Sale at all Dealers.***

**CARTER, DINSMORE & CO.,**

**BOSTON, . NEW YORK, . CHICAGO,**

Makers of **Carter's** Inks, Mucilage, Type-Writer Ribbons, Carbon . . . Paper, etc., all of which are . . .

"Far and Away the Best, Because Scientific."

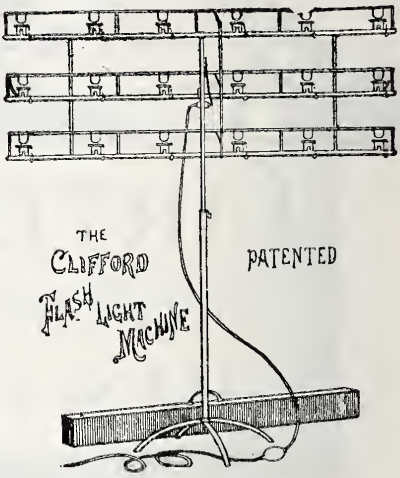
☞ *This is the Machine which has stood the Test of Time and came out Victorious.*

# The Clifford Flash-Light Machine.

(PATENTED.)

An entirely new way of burning the powder whereby all is burned and burned instantly.

No. 1, $18 00 No. 2, $26 50 No. 3, $35 00 No. 4, $26 50 No. 5, $35 00




The Clifford Flash-Light Machine is made entirely of metal. The full machine consists of three rows of six burners to the row, or one row of sixteen burners, and with this machine you can burn more powder and therefore get more light, if necessary, than with any other machine on the market.

With our mode of burning the powder, it all has to burn and instantly, and as it burns all of the powder used, it is the most economical. We use alcohol for burning, so when you get where you want to work you are all ready for business, have no gas connections to make or gas to manufacture, and you have no gasoline can to blow you up.

It has a spread of six feet, which is necessary in any machine, to give roundness to the picture. It can be easily elevated, so as to get the proper angle of lighting. This machine was invented by practical photographers for use by practical photographers for all kinds of work. It has been tested for all kinds of work that could be thought of, and under all circumstances it has never failed.

With either size machine is sent a neat, malleable iron stand of our own design, very light, rigid and strong, a carrying case, bulb and tube. No. 1 Machine consists of one row of six burners. (See cut of No. 3 Machine above, showing three rows of burners.) This gives a spread of six feet, which is necessary to give roundness to the picture. The No. 2 Machine consists of two rows and twelve burners—six to the row—each row six feet long. The No. 2 Machine has the same form as the No. 3 Machine, only one row less of burners. The No. 4 Machine consists of one row, the same as No. 1, except that instead of six burners it has twelve burners, and same capacity as No. 2. No. 5 is same as No. 1, except that it has sixteen burners, and packs into a little smaller compass than No. 1, and has nearly the capacity of No. 3. No. 5 packs, stand and all, into a box 2 x 6 in. and 6 ft. long. Nos. 4 and 5 are made for those who wish a more compact machine than Nos. 2 and 3, and do not care for the spread of light which they have.

The full machine packs into a box 4 x 5½ inches and 6 feet long, which is nicely stained and can be used as a carrying case. The full machine's weight is from seven to ten pounds. The machine can be set up and taken down in from one to five minutes.

This machine is fully guaranteed. Photographs showing work done with the machine will be sent on request. Full instructions will be sent with each machine.

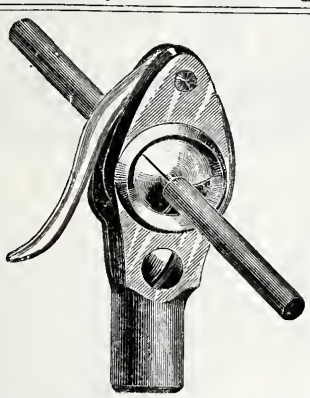
We have applied for a patent on a Smoke Retainer, and when placed on the market this great improvement will be furnished only on our machines. It will be so arranged that it can be fitted to the present Nos. 1, 4 and 5.

**CLIFFORD & CO.,**
INVENTORS AND MANUFACTURERS.

**THE SCOVILL & ADAMS CO. OF NEW YORK,**
GENERAL EASTERN AGENTS.

# WHITE'S Requisites in Posing and Lighting for the Studio.

White's Patents



# OTIS C. WHITE,

## Worcester, Mass., U.S.A.

**P. A. OF A., 1888.**

"For superior excellence in mechanism, quality and efficiency of movement, afforded by the Adjustable Extension movement in Slide-Rod, Ball and Socket Joints, as embraced in mechanical appliances directly and especially designed and adapted for the photographic studio."

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C. W. MOTES,
F. W. GUERIN,
*Vice-Presidents.*
W. H. POTTER, *Secretary.*
G. M. CARLISLE, *Treasurer.*

**From the Massachusetts Charitable Mechanic Association, Boston.**

FOUNDED 1795.

"Great ease and rapidity of adjustment in any desired position. A most valuable acquisition in mechanical movements, and one which, in the opinion of the judges, is in every particular worthy of the 'Highest Award' in their power to bestow."—GOLD MEDAL.

ANDREW J. GUSTIN,
DAVID W. POND,
SAMUEL F. SUMMERS,
} *Judges.*

**Awarded Medal Franklin Institute, Philadelphia, Pa., U. S. A.**

"The joint, while being superior in the convenience and rapidity of its adjustments and firmness of its grip, and supplying a new and additional movement to the ball joint, can at the same time be more cheaply manufactured than any other device known to your committee which will accomplish the same purposes."

[Signed,] S. LLOYD WIEGAND,
*Chairman of the Committee on Science and the Arts.*

[Signed,] WM. H. THORNE,
*Chairman Sub-Committee.*

THOS. P. CONRAD, W. M. MCALLISTER,
D. E. CROSBY, LOUIS H. SPELLIER,
C. CHABOT.

Medal and Diploma at Wiesbaden by the German Soeiety of Photographers, 1891.
Highest Distinction, Geneva, Switzerland, 1893.

**Five Awards, World's Columbian Exposition, Chicago, 1893.**

By a systematic application of this new mechanical principle instant adjustment and fixation to any desired position of the subject is obtainable.

WHITE'S POSING CHAIR, with either iron or wood bases. Patented October 27, 1891. Interchangeable parts. Easily adjusted in correct proportion for a large or small person.

WHITE'S IMPROVED POSING SUPPORTS, two styles. Prices reduced.

WHITE'S IMPROVED PHOTOGRAPHIC CHAIR HEAD-RESTS, with attaching plates for furniture or other chairs. Will follow the head to all positions, and is instantly secured by a single touch.

WHITE'S BABY HOLDER. Telescoping standard. For maintaining the child comfortably in pose without showing any of the supporting means, displaying child's draperies and in scenic effects.

WHITE'S IMPROVED PHOTOGRAPHIC HEAD SCREENS, three styles. Side Shades, square, oval or round. Great range of movement in any direction.

CAMERA TRIPOD HEAD, two sizes. Camera may be instantly leveled and directed without moving tripod legs.

☞ The patterns have all been reviewed and improved and prices reduced.

Send for Catalogue. For sale by all leading dealers.

**OTIS C. WHITE,**
**Worcester, Mass., U. S. A.**

Mention this ANNUAL.

# AMERICAN

Are QUICK, CLEAR and BRILLIANT.

Just what you want for First-class Prints.

# DRY PLATES

ARGENTIC PLATES FOR POSITIVE PICTURES.

No bath required ; will dry over a flame; are easily worked, and give beautiful results.

WE ALSO MANUFACTURE TO ORDER . .

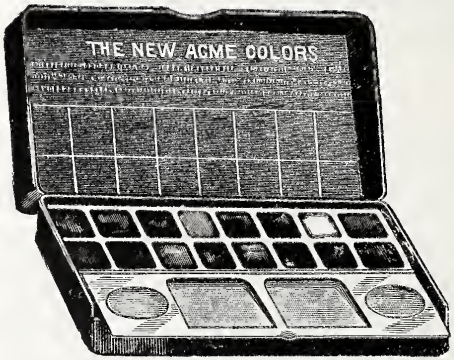
NON-HALATION AND STRIPPING PLATES.

Our LANTERN SLIDES will be in the market soon.

***AMERICAN DRY PLATE CO.,***

***WORCESTER, MASS., U. S. A.***

# THE NEW ACME Transparent Water Colors




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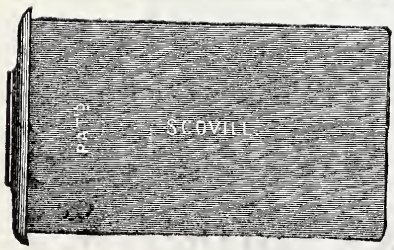
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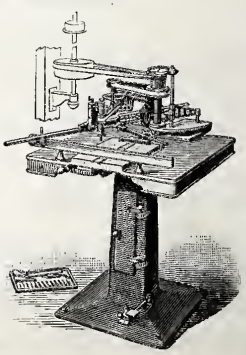
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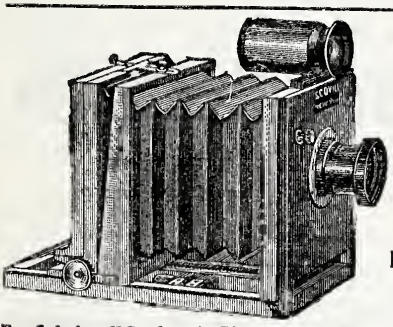
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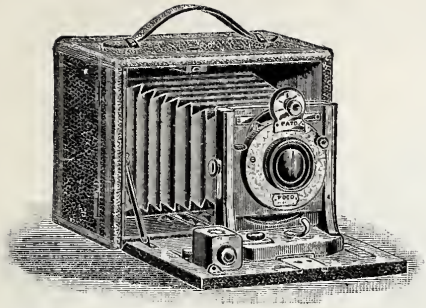
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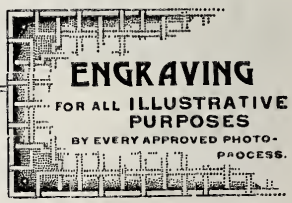
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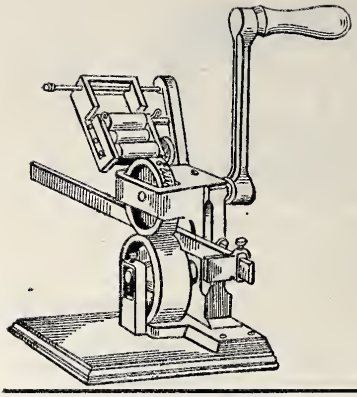
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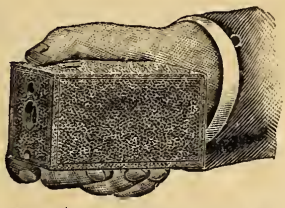
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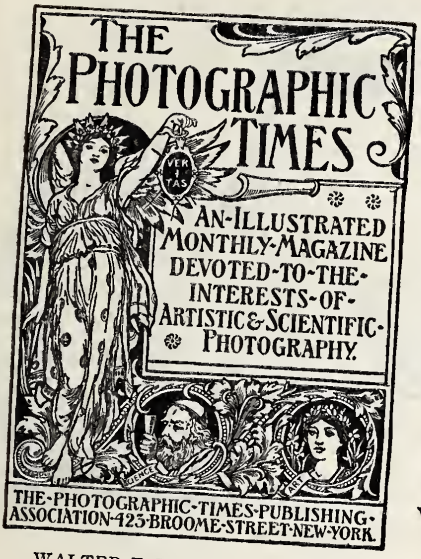
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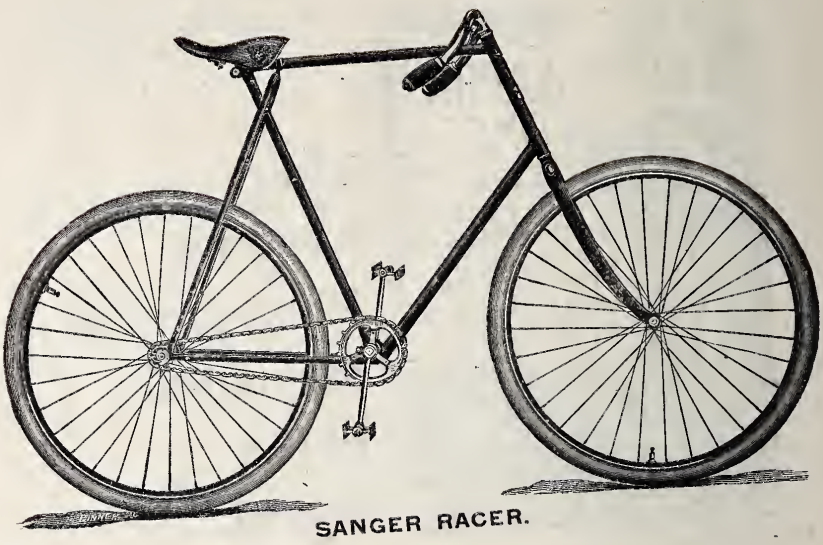
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